Vol. XXIX JULY 1935 Number 7

EXCAVATING ENGINEER

FOUNDED 1905

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Five drills sink holes through the hard rock in the open pit at Flin Flon Mine. An interesting account of Hudson Bay Mining and Smelting Company's operations in Northern Manitoba starts on page 321.

DON'T MISS THE SHOW-DOWN

A "Caterpillar" Diesel Seventy-Five Tractor pulls the wagons—another "Caterpillar" Tractor and Elevating Grader loads them—thus earth-moving costs are cut on this Pennsylvania road-building job.

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EXCAVATING ENGINEER

DEVOTED EXCLUSIVELY TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

Vol. 29 JULY, 1935 No. 7

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J. P. Burns digs 450,000 yards from high gravel mound for fill on New Jersey road project.

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F. O. WYSE
Managing Editor

ARNOLD ANDREWS
Editor

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BEHOLD the "Big Bertha" of dipper dredges—the mightiest dredge ever to dip below the waters of the earth. Operating under 50 feet of water through the steel muscles of **American Steel & Wire Company Tiger Brand Wire Rope**—it loads a 1500 yard scow in practically two hours—and doesn't even work a "sweat" up about it. When it came to selecting the right wire rope to engineer this giant—naturally the owners of this largest Dipper Dredge in the world turned to the builders of the largest selling wire rope in the world—**Tiger Brand Wire Rope.** Wherever dredges dip, derricks swing and weights suspend, you'll find this safer—more dependable—more economical wire rope operating in the thick of things. Facts—and full cooperation—await your inquiry.

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Blasting NEWS

PUBLISHED BY

NO. 1 HERCULES POWDER COMPANY INCORPORATED WILMINGTON, DELAWARE

FILL SETTLEMENT BLAST

BLASTING AIDS ROAD BUILDING OVER SWAMPS

The demand for the Hercules 88-page booklet, *Accelerating Swamp Fill Settlement with Explosives*, indicates that county and city road departments are joining state highway departments in using explosives to speed road construction over swampy areas. Nine years ago, the method was virtually unknown and three years ago it was used by only a few state highway departments.

An important advantage of this type of highway construction, as pointed out in the booklet, is that it makes possible straight, direct routes between points over swamps, marshes, and peat bogs.

Direct route construction is only one of many advantages obtainable by using explosives in fill settlement that are listed in this informative booklet. Other advantages, together with actual procedure, are published in detail.

Accelerating Swamp Fill Settlement with Explosives is especially important right now, with so much road building in progress. Contractors and engineers may obtain copies by writing to the Hercules Powder Company, Wilmington, Delaware.

Mining Coal For Mechanical Loading

How a prominent coal company has developed mining systems to utilize to best advantage its shaking conveyors and scraper loaders is the subject of an informative article published this month in *The Explosives Engineer*.

The article, by one of the company engineers, describes methods used in driving entries, using shaking conveyors in rooms, using shaking conveyors in long face work, and the general application of scraper loaders.

Copies of this article will be sent free on request.

HERCULES PLANNED BLASTING makes available:

1. Explosives exactly suited to your work.
2. Organized methods enabling you to use them to best advantage.

WRITE FOR DETAILS

Hundreds Want Vibrations Book

Hundreds of quarry and open-pit mine operators, contractors, consulting engineers, municipalities, and insurance companies requested copies of *Vibrations Caused by Blasting and Their Effect on Structures*, as soon as publication was announced.

Earthquake vibrations, if sufficient to cause any damage at all, produce cracks which are at right angles to each other.

This book, by Dean Edward H. Rockwell, contains scientific and technical information that heretofore has been unavailable, and which is of great value in refuting some of the claims for damage alleged to be caused by blasting vibrations.

Undoubtedly many other individuals and firms have a distinct interest in the data presented. Copies are still available for free distribution to executives.

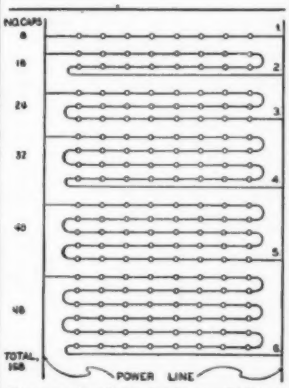

Diagram of graded series-in-parallel blast, showing how 168 electric blasting caps could be fired safely by a 50-cap blasting machine.

FIRING CAPS A NEW WAY

A blasting circuit, called the "graded series-in-parallel connection," makes it possible to load blasting machines greatly in excess of their ratings, a great help in many blasting operations.

This new method is fully described in a recent issue of *The Explosives Engineer*. The article points out that the graded series-in-parallel connection broadens the use of blasting machines for electric blasting, making it possible, for example, to shoot several hundred caps at one time from a 50-cap machine.

Copies of the article will be furnished on request.

Blasting In Metal Mines

Probably no metal-mining study of drilling and blasting practice is more complete than *Drilling and Blasting in Some American Metal Mines*, a book of 197 pages published by Hercules Powder Company.

This book, presenting a study of methods in 90 leading mines, represents the results of the work of the country's foremost mining engineers.

Drilling and Blasting in Some American Metal Mines is so arranged, illustrated, and tabulated that it can be used as an easy guide to help in the solution of blasting problems for properties of various sizes and characteristics.

The increasing importance of metal mining makes the book of unusual importance at this time. *Drilling and Blasting in Some American Metal Mines* is available free of charge, to men in positions to utilize it.

IMPROVED BLACK POWDER DESCRIBED

Just off the press is a booklet describing a new pellet powder that represents an important addition to the Hercules series. The new powder is called Pellet "D" and its distinguishing feature is a great reduction in the smoke and objectionable fumes usually associated with black powders and which has made them unsatisfactory for many classes of work. When using Pellet "D" the miners are enabled to return to the face much more quickly after the shot, work is speeded up, and output is increased. Pellet "D" produces clean, solid lump and a maximum of coarse coal.

For a copy of this booklet, address Hercules Powder Company, Wilmington, Delaware.

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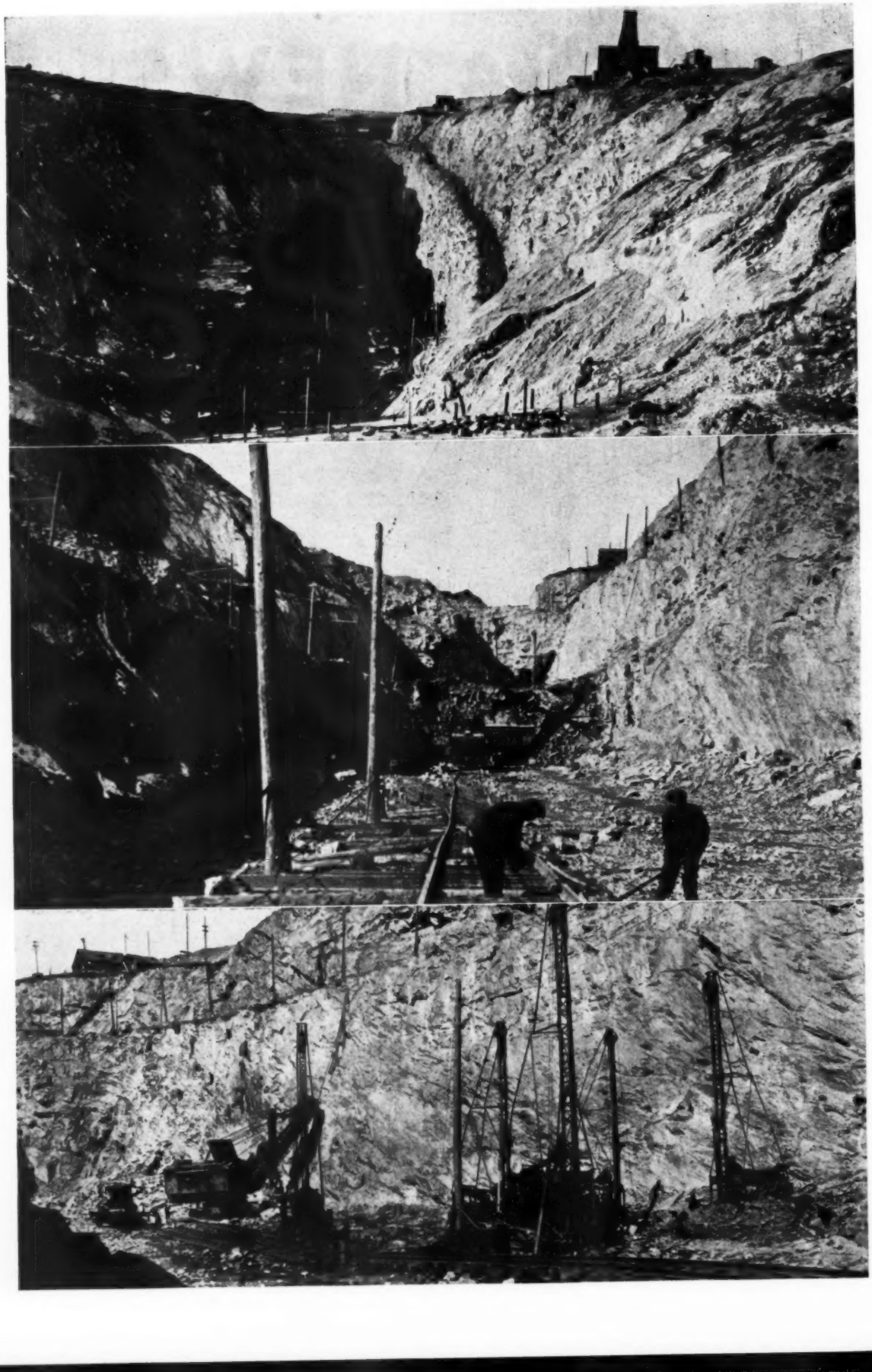

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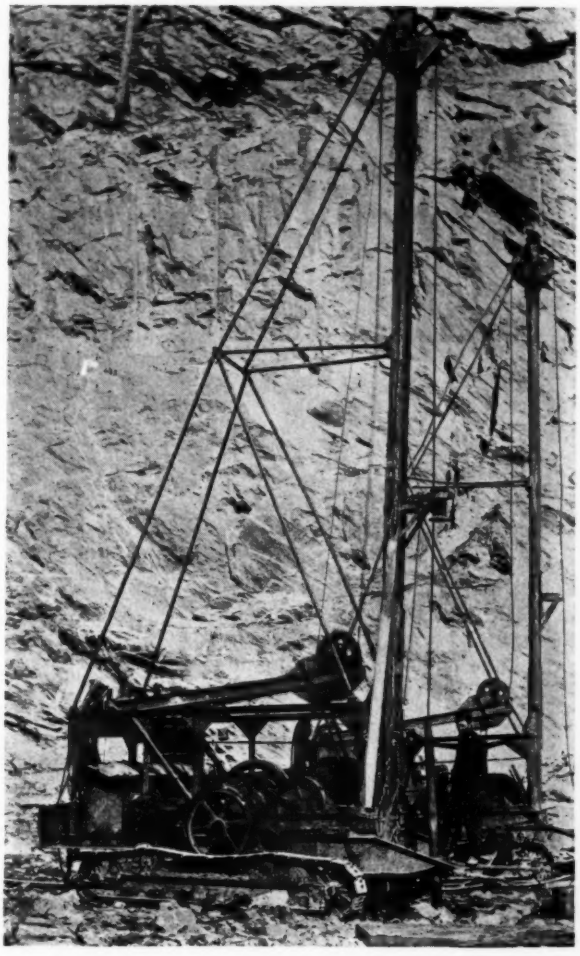
JULY 1935
VOL. XXIX NO. 7

Open Pit Operations at Flin Flon

Temperatures frequently range to 50° below for long periods on this far north venture of Hudson Bay Mining and Smelting Company, Ltd.

By M. A. ROCHE
MINE SUPERINTENDENT, FLIN FLON



● *In hard going all the time—these Bucyrus-Armstrong all-steel drills average 1.8 feet per hour when drilling ore, and 3 feet per hour in waste rock.*

THE FLIN FLON plant, owned and operated by the Hudson Bay Mining and Smelting Company, Ltd., is situated on the Manitoba-Saskatchewan boundary at latitude North 54 degrees, approximately 90 miles north of The Pas, Manitoba.

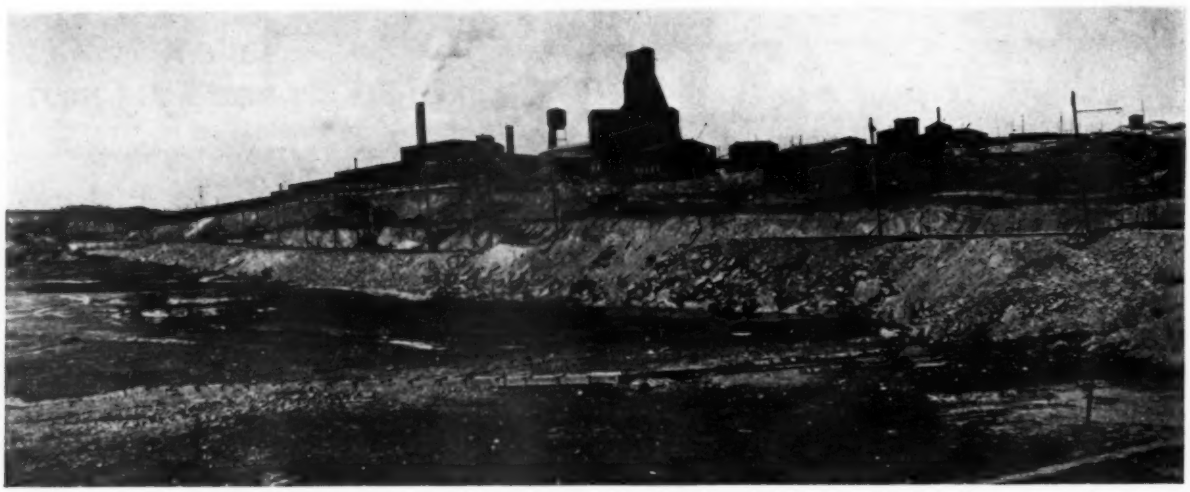
Like many others in Northern Canada, the ore body was partially covered by water, the original discovery being made on a strip of land jutting into Flin Flon Lake.

The deposit was discovered in the fall of 1914 by Tom Creighton, an experienced prospector and trapper, who made his headquarters in The Pas, Manitoba, and who still resides there.

The property was optioned in 1915 to Haydon Stone and Company, who completed 7,500 feet of diamond drilling. Messrs. Early and Forkin optioned the property in 1917 and completed a further 18,000 feet of diamond drilling, securing a 32 per cent interest in the property. In 1920, W. B. Thompson and Mining Corporation secured an option, shafts were sunk, drifts and cross-cuts driven, and check samples taken. Due to the low grade and complex character of the ore, and the distance of the property from coke, coal, and electric power, the project lay idle until 1925. In that year it was brought to the attention of R. H. Channing, Jr., agent for the late H. P. Whitney, of New York. Examination of the ore body and power site by R. E. Phelan, Chief Engineer for Mr. Channing, led to subsequent treatment of the ore in Denver, Colorado, at a complex ore-recov-

Frontispiece

● *Top: Looking down into the pit from the south end. Immediately in the foreground can be seen the top of a concrete retaining wall built to prevent boulders and earth slides from washing into the pit during heavy rains. Center: Mining operations are under way on two levels. Bottom: Five Bucyrus-Armstrong drills sink 50-foot holes ahead of the shovel digging on the lower level.*



● *A rock-fill dam separates the pit from the lake immediately to the west. The top of the pit can be seen just behind the dam and tracks, with the plant in the background.*

ery plant owned by the H. P. Whitney interests. The property was optioned by Mr. Channing, and upon results obtained in Denver and experimental work in Flin Flon, the option was exercised and the property taken over. The Hudson Bay Mining and Smelting Company, Ltd., was incorporated in 1927, and the work of developing the ore body, plant construction, and development of the power site on the Churchill River was started immediately. Actual mining of the ore was started in August, 1930.

Ore Contains Gold, Silver, Copper and Zinc

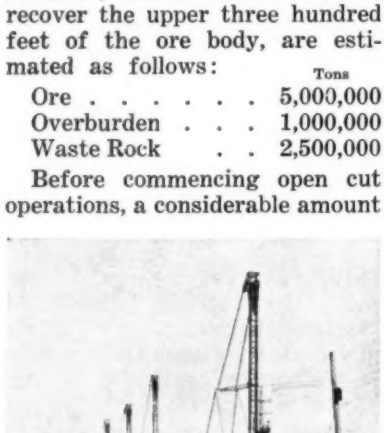
In plan, the central part of the ore body, at surface, attains a width of about 450 feet, including waste horses. The deposit narrows gradually toward the south, and stretches out to a long, narrow tongue at the northern extremity, the mineable length being about 2,000 feet at surface. The main body is a hard solid sulfide ore, containing gold, silver, copper, and zinc, with variable widths of talcy-disseminated copper ore occurring on the footwall side. The deposit occurs in a greenstone area, the country rock being quite hard on the hanging-wall side, and much softer on the footwall. The greater part of the ore body was covered with 15 to 90 feet of mud and clay, which was removed by dredging and electric shovels.

The plant treats an average of 4,400 tons of ore per day, all the tonnage being supplied by the open pit and underground mine. The open pit produces 2,700 tons daily, with the underground mine supplying the balance of production.

Final tonnages from open pit methods, which will be used to recover the upper three hundred feet of the ore body, are estimated as follows:

	Tons
Ore	5,000,000
Overburden . . .	1,000,000
Waste Rock . .	2,500,000

Before commencing open cut operations, a considerable amount of data was collected pertaining to the various methods of rock drilling and blasting practiced at other properties, and experimental work was carried out to ascertain the method best adapted to local conditions at Flin Flon.



● *Four drills were used here in making the approach cut to the pit.*

Eight Blast-Hole Drills Used in Open Pit

Two Bucyrus-Armstrong No. 29 caterpillar-mounted, electric-powered, all steel, blast-hole drills were brought to the plant for trial purposes early in 1930. Satisfactory footages were obtained in the various types of material to be drilled, and the rigs, being caterpillar-mounted, were readily moved over the uneven rock surface and frequently soft and treacherous overburden. Later in the same year, six more No. 29 blast-hole drills were purchased. The eight machines proved sufficient to keep drilling well ahead of tonnage requirements.

The six-inch bits used on the drills are sharpened in the section of the drill shop which furnishes steel to the underground workings. An average of 100 to 150 bits are sharpened per day, depending upon the number of rigs working, and the type of ground drilled. Dull bits are sharpened in a No. 8 Bucyrus-Armstrong bit dresser, and then transported to the rigs by a General Electric 20-ton electric locomotive detailed for general open pit service. Drilling line used is ¾-inch, 6x25 construction, Samson Tru-Lay preformed wire rope, supplied by the Dominion Wire Rope Co., Ltd.

Drill crews were recruited from the construction force, and were soon trained to the churn drilling work. The drill crews prepare the holes for loading, under proper supervision, and load and blast as conditions demand, working two shifts per day, either eight or ten hours.

Low Temperatures Increase Drilling Difficulties

With temperatures ranging frequently as low as 50 degrees below zero for long periods, the greatest care must be exercised to prevent drill bits and stems from sticking in the hole. The water used in drilling is splashed on the sides of the holes, and forms ice in the upper four or five feet of the hole. If this ice is not blasted free at intervals, the stems and bits become wedged in the hole, with consequent delay and loss of footage.

Over a period of four years operation, each of the machines has averaged 15 to 17 feet of 6-inch hole per shift, this average covering drilling operations the year round and all delays due to severe winter conditions. Actual drilling time averages about 63 per cent of total time. About 3 per cent of the lost time is absorbed in moving, and the remaining time lost is taken up in making repairs, reaming holes, changing bits, springing holes, and miscellaneous delays.

Drills Average 1.8 to 3 Feet per Hour Actual Drilling Time

The normal footage obtained, when the machines are actually drilling in ore, is 1.8 feet per hour, and the same for drilling in the hanging-wall waste and interbanded waste rock included in the ore body. The disseminated ore and foot-wall waste drill at an average of 3.0 feet per hour.

The drill rigs, due to their mobility, were particularly useful in drilling through the clay and boulder overburden, and, by casing the holes to the ore and waste rock contacts, the uneven underlying rock surface was drilled and blasted to establish a level footing for subsequent mining operations.

● *A view of pit operations from the north end.*

The upkeep of the machines has not been excessive, and drilling costs compare favorably with similar operations at other properties. The ability of the machines to move up steep grades under their own power, and to move onto ledges and uneven spots with a minimum of cribbing and blocking has made them particularly adaptable to conditions at Flin Flon.

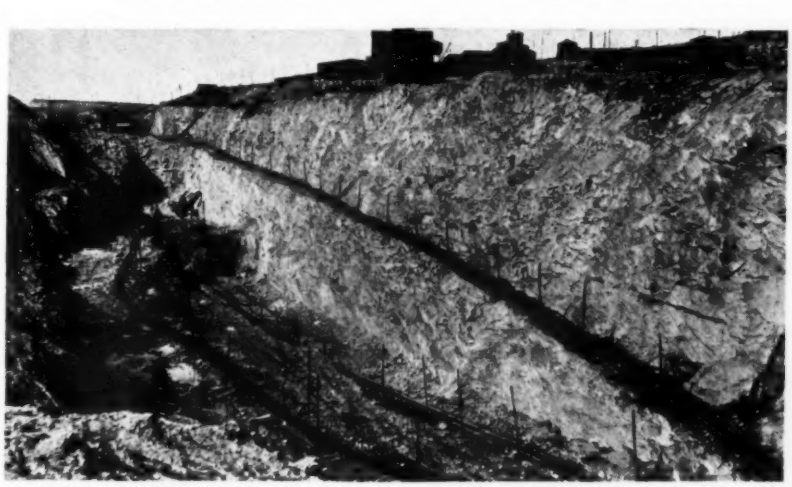
Blast-Hole Drill Helps Out Underground

Upon one occasion a drill rig was knocked down and taken underground to drill pilot holes for sinking operations in the main hoisting shaft. Holes up to 200 feet in depth were drilled in the center of the shaft, and holed through to lower level pilot work. The holes served to drain off troublesome water in the bottom of the shaft; aided in the ventilation of the lower shaft workings; and were used as cut holes in sinking and pilot raising operations. Rounds of 10 to 16 feet were drilled and blasted in the hardest of rock and ore formations. At one stage of the sinking operations, air and water hoses were run through the holes to the miners below, and a small staging for the miners was supported, raised, and lowered by cables run through the holes from a hoist above.

● *Another view of the pit taken from near the south end. The tracks going up the incline on the right lead to the crusher.*

Holes Drilled to Minimum Depth of 50 Feet

The spacing of drill holes, a very important factor in successful open pit blasting, has received continuous study, and the present practice is to space the holes on 16-, 18-, and 20-foot centers.



• *It was necessary to use cribbing under the drills when they worked on the muck of the former lake bottom during the opening of the pit.*

Variations are made when drilling hard ribs of interbanded material. The depth of the holes also varies. In 1930 and 1931, holes were drilled to a depth of 20 to 25 feet, which was increased in 1932 to 40 feet. During the latter part of 1933, and in 1934, the blasting of 50-foot holes, and occasionally, holes drilled to 60 feet, was successfully attempted. All holes, when practicable, are now drilled to 50 feet, or deeper. During recent months of open pit operation, rim drilling of holes along the pit walls has become necessary. Rim holes are drilled on 5-foot centers, and powder charges in alternate holes are staggered to minimize the shattering effect upon side walls and track berms. Pit walls are maintained as solidly as possible in this manner, with the mining of a minimum of waste material.

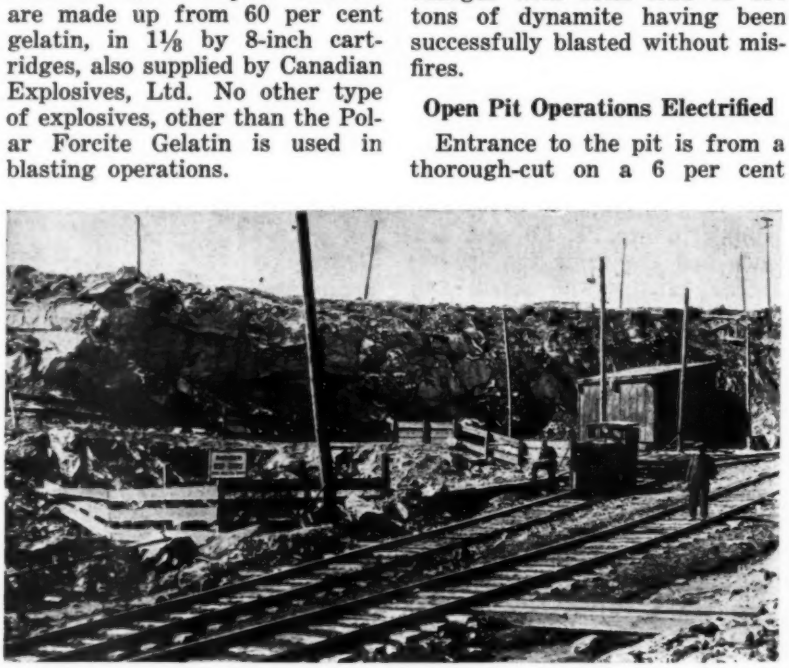
The holes, when drilled to the desired depth, are generally sprung, or chambered, and are bailed out with Bucyrus-Armstrong rigs, and prepared for blasting. Springing is accomplished with successive charges of 50 per cent gelatin, the number of charges being determined by the size of the chamber required, based upon the burden on the hole. Water is used for stemming the holes when springing the pocket. Polar Forcite Gelatin, 50 per cent strength, supplied in 5-inch by 16-inch cartridges, by Canadian Explosives, Ltd., is used for springing and blasting the holes. When the final charge for breaking ground is placed in the chamber, sand stemming is added, and next the deck charge is placed. Top charges are not frequently resorted to in holes less than 25 feet in depth. Primers are made up from 60 per cent gelatin, in 1⅛ by 8-inch cartridges, also supplied by Canadian Explosives, Ltd. No other type of explosives, other than the Polar Forcite Gelatin is used in blasting operations.

Special Precautions Taken to Prevent Misfires

Instantaneous waterproof No. 8 electric detonators are used, two in both bottom and deck charge primers. The extra caps are used to insure against misfires, which might occur by the use of a single detonator, especially when considering that the first holes, loaded in large blasts, may remain loaded for a period of 15 to 20 days, awaiting completion of loading of the entire blast. No. 22 enamelled wire is used for leads. Special-grooved wooden sticks are placed the full depth of each hole to protect the wires, which are run up the groove sawed in the stick for this purpose. This method of protecting the wiring has been developed locally to cope with certain characteristics of the solid sulfide ore. Resistance of the ore body, as registered on a galvanometer, is identical with that of a faulty cap circuit and as the ore tends to break in ragged edges on the sides of holes, damage to wiring, if unprotected, is frequent. Due to the conductivity of the ore, it is quite difficult to detect any short circuits resulting from damaged wiring. The method of loading and wiring, as described, has entirely eliminated the occurrence of missed holes in open pit blasting, charges with total load of 150 tons of dynamite having been successfully blasted without misfires.

Open Pit Operations Electrified

Entrance to the pit is from a thorough-cut on a 6 per cent



• *The danger sign and fence mark the top of the mine back-fill shaft. To the right, the house shelters the fans which provide ventilation for the workers underground.*

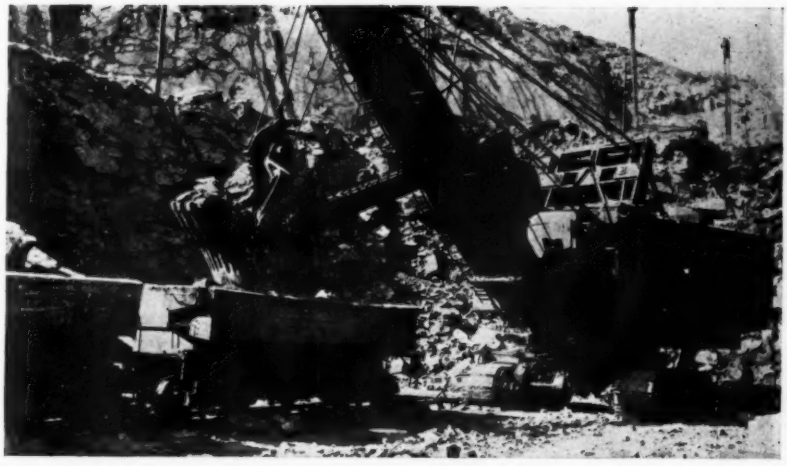
grade along the narrowest portion of the surface outcrop of the ore body. The approach track follows down the hanging wall, and is placed in the waste rock, of which the removal of a certain tonnage is necessary to provide proper slope to the hanging wall side of the pit.

Early in 1930, the Hudson Bay Mining and Smelting Company purchased two 85-ton General Electric steeple-cab-type electric locomotives for pit service, and several 20-ton G.-E. electric locomotives to be used as spotting engines on the pit floor and benches, and for general service work. In addition to purchasing the locomotives, the Company ordered twenty-three 22½-yard drop-door, air side-dump, Western-Wheeled Scraper cars. The performance of the locomotives has been excellent, and they have proved particularly adapted to the work on the steep grades, hauling from 100 to 120 tons of material per train. With the two 85-ton locomotives, a total of as high as 3,500 tons of material has been hauled an average distance of two miles in one ten-hour shift. The average, however, is just over 1,000 tons per locomotive ten-hour shift. Although some delays are encountered during most severe winter weather and heavy snow storms, performance on the whole has been very consistent and efficient.

Open pit trackage is 85-pound steel throughout, standard gauge, and laid on ties obtained locally. When final open pit levels are mined, there will be approximately 8,000 feet of trackage in the pit proper, not including that necessary for waste disposal and switching yards. Waste tonnage has been disposed of at various locations within the Company property, and will eventually be utilized for mine fill.

Two 4-Yard Shovels Load Ore and Waste Rock

As previously pointed out, the ore to be loaded in the open pit is of two types, namely, solid sulfides and disseminated. Due to the weight of the solid sulfides, and the necessity of segregation of the waste rock and the two varieties of ore, there was some question as to the type of shovel best adapted to the work. Two Marion electric, four-yard shovels load the majority of the ore and waste. In the hands of experienced operators, it has been found that the shovels can effect a close segregation of the two ores and the waste rock. The two shovels have loaded, on the average, 1,000 to 1,500 tons of material per ten-hour shovel shift. Periods between shifts are utilized for the bulldozing of boulders and for miscellaneous work. Repairs to the shovels are handled in the pit by the operators, with the exception of jobs which require shop work. Three Marion, 1¼-yard electric shovels are used for miscellaneous work in the open pit, mine fill pit, and flux pit. Another 1¼-yard gas-electric, is reserved for use on miscellaneous work where electric power is not available. All these 1¼-yard shovels are readily convertible to drag lines.



• *A 4-yard electric shovel, working in the lower level, loads heavy ore to the 22½-yard dump cars.*

• *Drilling operations proceed the year round even though temperatures drop to 50° below zero for long periods.*

Pumping in the pit does not present a serious problem, excepting during the summer season, when sudden and heavy rains may cause serious tie-ups. The normal influx of water drains down two prospect shafts into the underground mine, where bulkheads and valves are installed to control the flow. Numerous flumes and ditches around the borders of the pit dispose of a large volume of the run-off water, and further additions have been made to the drainage system to prevent possible shut-downs from flooding.

Extensive Lighting System Necessary

Electric energy for pit operations is brought in on power lines along the hanging wall. These are taken down through churn-drill holes into a short drift off the pit floor. At this point distribution from the 2,300-volt A. C. feeder to the motor-generator sets on the shovels is by two, four-conductor, armored trail cables. The Bucyrus-Armstrong drills receive power from a 550-volt A. C. feeder with individual trail cables tied in to the central

● *A Morris 10-inch pump keeps the old lake bottom dry between the outer and secondary dams. Just behind the crest of the dam can be seen a portion of Flin Flon Lake.*

supply station on the pit floor. The trolley system operates on 550-volt D. C. supplied by rotary converters located in the main plant sub-station. Batteries of flood lights are mounted on the pit walls. All drills and shovels carry individual lighting equipment. During winter months, daylight ends at about 4:30 p. m. and darkness lasts till about 9:30 a. m. Adequate lighting is therefore extremely important for 24-hour operation.

Dams Constructed to Permit Recovery of Ore Lying Under Water

After the general scheme of operations had been decided upon, early consideration was given to: the problem of damming off that portion of Flin Flon Lake overlying the ore body; to dewatering this area; to building secondary dams close to the future open pit, to prevent influx of large quantities of mud from the dewatered lake bottom outside the actual open pit area; and to the removal of the mud and clay overburden from the ore deposit. The greater part of the ore body was covered by 12 to 15 feet of water, and 15 to 90 feet of mud and clay, the material to be removed being estimated at approximately 1,000,000 tons.

Construction of the dams was started early in 1927, when mine waste from underground exploration work was loaded from the mine cars into bottom-door hopper bins, mounted on barges formerly used in freighting material to the plant site. The barges were powered with outboard motors. In this fashion, several thousands of tons of material were transported to the dam locations, a distance of about one-half mile. During the winter months, narrow gauge tracks were laid over the ice, mine cars were hauled in trains by horses, and dams were built from 6 to 10 feet above water level by trestles built on the ice. During the summer of 1929, standard gauge track was laid along the lake shore to the dams, and after sufficient material had been placed, the fills were levelled off and faced with clay from nearby hillsides. Small shovels, 8-ton Plymouth gas locomotives, and 6-yard Western dump cars were used for this work.

● *One of the two General Electric 85-ton electric locomotives pushes a trainload of ore up the 6 per cent grade to the crusher.*

Secondary Dams Built for Additional Protection

The section to be drained included the open pit and an area bordering immediately upon the west side of the pit. Here the rock bottom was deeply covered with mud and clay. To insure the open pit operation against slides from this area, a secondary line of dams was constructed along the west side of the pit. These dams were partially constructed during the winter months of 1929-1930, material being hauled over the ice, on standard gauge track, and dumped through openings at intervals along the track. Rock loaded from horse backs in the pit was used to complete the dams during the following summer, being hauled in both end- and side-dump cars. Due to its weight, the rock sank through the mud, and came to rest upon a hard, firm stratum of clay, forming a very stable footing for the dams.

At certain points where the pit outline is intercepted by deep depressions in the former lake bottom, it was thought necessary to further safeguard against possible slides by reinforcing the rock dams on the pit side with concrete retaining walls. These were put in by cofferdam methods during the fall and winter months.

Two Pumps Dewater Pit Area

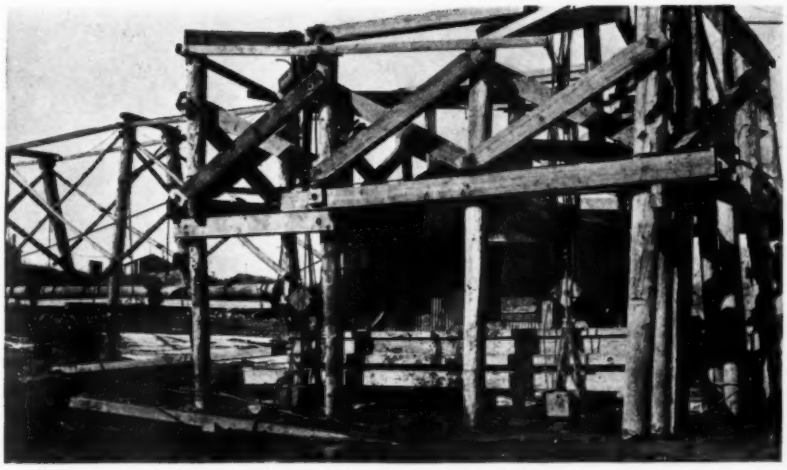
In the spring of 1930, two 24-by 24-foot barges were constructed on the ice, and placed in enclosures of piling driven through the ice. Morris 10-inch dredging pumps, directly connected to 250 h.p. electric motors, were hauled over the ice, and mounted on barges. Sixteen-inch, wood-stave discharge lines were laid on pontoons within piling supports, and the complete installation was prepared for operation immediately after the spring break-up commenced. One barge was located near the first line of dams, at the lowest point in the section to be dewatered. The second barge was placed directly over the deepest known point in the clay deposit,

within the secondary line of dams. The discharge line from the second pump was also suspended upon pontoons, and carried the mud and water discharge over the secondary dams, from where it flowed by gravity to the No. 1 pump, which relayed the discharge over the first line of dams into Flin Flon Lake proper. Pump output was estimated at 3,500 gallons per minute, and dewatering was completed by the end of May. The dams, formed of mine waste overlaid with surface clay, were almost watertight and allowed very little return flow into the dammed-off area.

The mud and clay deposit to be removed was roughly 1,000 feet by 500 feet in area, with a maximum depth of 90 feet in places and an average depth of 20 feet over the whole deposit. It was found to be too sloppy to support heavy shovels or draglines for excavation work, and it was therefore decided to remove the deposit by modified hydraulic and dredging methods, utilizing the No. 2 pump layout already installed over the deepest known point in the mud and clay.

A second deck was built over the pump and motor, and 35 and 60-h.p. Sullivan double-drum electric slusher units were installed together with a Lidgerwood double-drum air hoist. The hoists operated 48-inch "V" type scrapers, supported by an overhead trolley system, with slusher tail lines running over 48-inch sheaves on portable "A" frames, which were moved along the former shoreline as necessary.

The lower strata of material scraped were very sticky, and were inclined to come in to the pump sump in large chunks. Water was piped into the scraper cuts, and scraper action generally set up sufficient agitation to break up the larger pieces. It was necessary, at times, to obtain further agitation in the pump sump by using water at high pressure in fire hoses and nozzles. Dynamite was frequently used for bringing material down into the scraper cuts. For this work, 20 per cent Forcite stumping gelatin proved satisfactory.



● *The Morris pump, motor, and house are supported by cable slings. These are suspended from piles driven deeply into the mud of the former lake bottom.*

As dredging continued, and the scrapers neared bed rock, some difficulty was experienced with scraping large boulders to the barge, and filling up the sump. A separate scraper unit was installed to keep the sump clear of these boulders. Overhead trolley cables were used to service the equipment on the barge. The discharge line and barge were held securely in place by cables anchored to the rock on the former lake shore.

High-pressure monitors were used in places to sluice off the mud and clay from the ore surface where it was particularly rough and uneven. The clay, if allowed to mix with the ore, gives considerable trouble in the crushing plant and concentrator.

Dredging operations were, of course, suspended during cold weather. But during the three seasons of operation, necessarily short in this latitude, over 789,000 tons of material was removed by this method, at very satisfactory cost.

Power Shovels Complete Stripping

Because of the irregular rock surface underlying the area being stripped, it was impossible to remove all the clay with the scrapers. The approximate 300,000 tons remaining were removed by shovels. Open pit equipment, previously described, was used for this work, with the addition of a Shay geared steam locomotive. This was used on the very steep grades which were unavoidable because of the uneven surface and limited space available for trackage. The shovels worked on rock bottom wherever possible, and when it was necessary to take them over depressions containing soft clay, pads were placed under the shovel crawlers. The pads were made of fir timber, 14 inches by 20 inches, and were armored on the bottom side with $\frac{5}{8}$-inch boiler plate. Since the material to be taken out would not support a shovel, each cut was taken down to rock bottom, which frequently necessitated high faces in the treacherous clay and mud. A crew was maintained to blast down material to safe working faces, and to minimize the danger of slides in the slippery clay. Considerable difficulty was experienced in maintaining trackage on the uncertain bottom, and shovels were often working in four to five feet of soupy clay and water. Stripping operations were completed late in 1932, in ample time to ensure uninterrupted open pit mining.

The minister called at Contractor Jones' home on Sunday afternoon, and Willie answered the bell.

"Pa ain't home," he announced. "He went over to the golf club."

The minister's brow darkened, and Willie hastened to explain: "Oh, he ain't gonna play no golf; not on Sunday. He just went over for a few highballs and a little stud poker."

Steam Shovel Digs Fish Ponds

● *The shovel keeps ten trucks on the go working in soft ground. So soft, in fact, that plank runways had to be made, as otherwise even the light trucks used would sink in.*

By **SPENCER A. JONES**

FUTURE generations of fresh water bass and bream in North Carolina should be very grateful for the commodious nursery ponds now being dug for their exclusive use by an old Bucyrus-Erie steam shovel about ten miles west of Fayetteville, on U. S. Route 401. Here the Division of Engineering and Resources of the State Department of Conservation and Development is constructing two new fish pools, each about one acre in area, at the State Fish Hatchery and Game Farm.

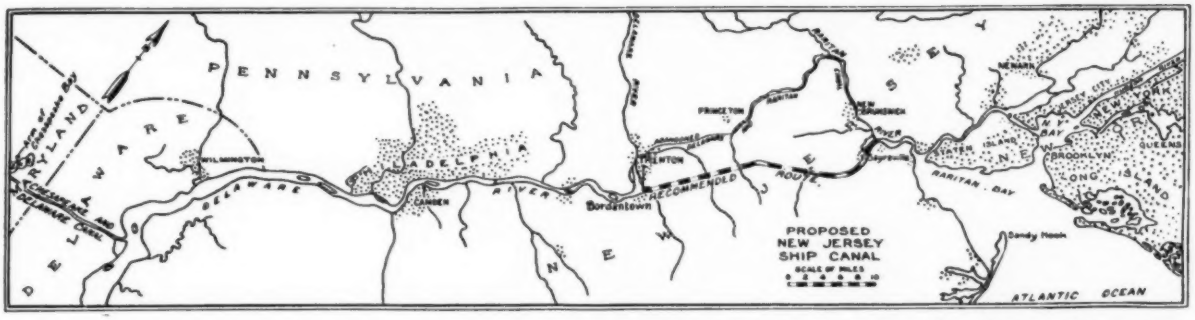
Under the supervision of Major H. D. Panton, Chief Engineer, Division of Water Resources of the North Carolina State Department of Conservation and Development, and S. D. Cresswell, Resident Engineer and Superintendent, the department is carrying on the work itself. All common labor is performed by state convicts and all skilled labor by paid employees of the department.

From forty to fifty convicts, guarded by three well-armed gentlemen, have quite a job ahead of them rebuilding and rolling down an earth-fill dam across Bones Creek. The old dam was partially washed away not so long ago. In addition they are building the concrete spillway section of the dam. This section is fifty feet long, fourteen feet thick at the base and seventeen feet high. It rests on about one hundred 12-inch yellow pine piles which are driven either to twenty-five feet penetration or to refusal. The spillway is designed to handle a flow of 2,000 second-feet. The wing walls of the new concrete will be extended to and tied in with the existing wing walls of the concrete bridge over which Route U. S. 401 crosses the stream.

Each of the new fish ponds will require the excavation of 9,000 cubic yards of sand, mud and clay, (not to mention stumps and buried logs which are piled up and burned). William Sullivan, the shovel runner, learned his trade on this old ¾-yard Bucyrus-Erie steam shovel, the number of which is B-2911*. What its age is, nobody around the job seemed to know, but Bill Sullivan claims he doesn't care how old it is, he can still move plenty of dirt with the old steamer. All he asks is that Pat Davis, his fireman, keep a good head of steam in the boiler. This old Bucyrus-Erie, by the way, is owned by Cobb & Homewood, Chapel Hill, North Carolina, and is leased by them to the State Department of Conservation and Development. When the writer visited the job, the old shovel was keeping ten light trucks on the jump, each truck hauling and dumping on the earth dam at a distance of about 150 yards from the fish ponds.

● *Left: Convicts from the State Prison build an earth-fill dam with concrete spillway. Some of the stripes on the uniforms are horizontal, while others are vertical. No one on the job seemed to know why. Maybe the convicts have a choice. Right: This old Bucyrus-Erie ¾-yard steam shovel would have easy digging if it weren't for the logs and stumps buried in the earth.*

*Editor's Note—According to information received from Bucyrus-Erie Company, South Milwaukee, Wisconsin, this shovel was shipped from the factory April 4, 1924.



● *The new canal will shorten the present water route of 27½ miles between New York and Philadelphia to 87 miles.*

Modern Canal Planned for New Jersey

Extensive study made before locating proposed canal from New York Harbor to Delaware River

By **VAN DYNE PELL**
MEMBER, AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS

THE PROPOSED New Jersey ship canal, if built, will add another link to the United States Intra-coastal Canal System which, when completed, will extend along the Atlantic seaboard, cross Florida, and follow the Gulf coast into southeastern Texas. The New Jersey section of the route strikes southwesterly across the narrowest part of the state for a distance of 31.5 miles —from the lowlands of the Raritan River near Sayreville to the Delaware River at Bordentown, four miles below Trenton, New Jersey. With existing waterways, it would complete a short inland route for ships between the principal North Atlantic ports, and make direct connection at Norfolk, Virginia, with barge canals leading into the Carolinas.

Engineers place the estimated cost between $187,000,000 and $210,000,000 of which $84,000,000 would be required for the excavation of the canal and approaches. Comparatively, these figures represent sums equal to 69 and 76 per cent of the cost of the Panama Canal which is 33 per cent longer, but only 13.7 per cent larger by volume of excavation.

The plan for a system of intra-coastal canals is not a new one, for it dates from Colonial Days. George Washington, who foresaw the full value of such a method of transportation, strenuously advocated the improvement of inland waterways, for he considered an extensive canal system an important means of transportation along the seaboard, as well as a vital factor in the development of commerce between the coastal cities and frontier settlements. But little or no activity started until 1784, when the Legislatures of Virginia and Maryland concurrently granted a charter to the Potomac Company, authorizing construction of a canal along the Potomac River above what is now the site of Washington, D. C.

With continued national expansion following the War of 1812, business leaders gradually recognized the need for improved transportation facilities. They finally adopted a vigorous construction program, which resulted in a network of canals extending up and down the coast, and east and west to the interior.

The Chesapeake and Delaware Canal, leading from the Delaware River a few miles below Wilmington, Delaware, to the upper Chesapeake Bay, is one of the early canals built in this country. Construction, financed by private capital, started in 1824; and five years later, after overcoming many physical difficulties and obstacles, the canal was finally opened for traffic. During the Civil War, it again came into prominence as a route to facilitate troop movements and the transportation of munitions, especially at those times when hostile armies put railroads out of commission by the demolition of roadbeds and bridges. Recently the canal has been re-aligned and deepened by Army Engineers, and now, after more than 100 years, it is still in operation as a part of the United States Intra-coastal Canal System.

Private capital also financed the construction of two canals across New Jersey from the Delaware River to tidewater, near New York Harbor. Both canals were well located and had substantial commercial feeders. One, known as "The Old Morris Canal," traversing the Iron Mine region of New Jersey and making connection with the Pennsylvania coal fields, was opened to navigation in 1831. It was operated for many years and did not pass out of existence until 1924, when it was ultimately drained for abandonment. The route of the other, the Delaware and Raritan, the

● *Over 300 holes, ranging from 21 to 189 feet deep, were put down along proposed routes of the New Jersey ship canal.*

forerunner of the proposed New Jersey Ship Canal, follows a meandering course for 44 miles by way of Trenton and Princeton, from Bordentown on the Delaware River to New Brunswick on the Raritan River, the latter a tributary to New York Harbor. Construction was completed in 1834 at an approximate cost of $2,500,000. With profitable cargoes of coal, and other heavy freight for the New York and Philadelphia trade, operation soon became successful and produced attractive dividends until long after the Civil War. But later, owing to high tolls and unsatisfactory accommodations, traffic steadily declined until it consisted of only a few light pleasure craft, making seasonal trips to and from southern waters. The canal was finally discontinued in 1933.

A route for a modern ship canal across New Jersey has been under consideration for more than 40 years. In 1894, the city council of Philadelphia authorized a commission "to make a survey for a ship canal between the Delaware River and the Atlantic Ocean," and set aside an appropriation of $10,000 to cover the cost of the investigation. The next year, in 1895, the Commission reported in favor of a route, approximately parallel to the Pennsylvania Railroad, from Bordentown to the mouth of the Raritan River. After further study, authorities abandoned the original location for one situated a few miles to the south in an area entirely free from rock. In 1930, Congress authorized an investigation by Army Engineers for the purpose of finding and recommending the most suitable route, together with plans and costs estimates, for a waterway across the State of New Jersey. Accordingly, the North Atlantic Division Engineer appointed a special board of engineer officers to carry out the assignment, which included such studies as: salinity; pollution; tidal conditions; water supply; ground waters; vessel traffic; bridge, lock and dam design; land transportation; and engineering geology. Actual investigation started in 1931 and continued for more than two years at a total cost of $120,000, including test borings, labor, field surveys, administrations and all other contingencies.

Extensive Survey Made

Naturally, such a broad study required considerable field work. Members of the United States Army Air Corps at Mitchell Field, Long Island, made aerial photographs of the entire strip across New Jersey while field parties releveled old monuments and located new lines. After the consolidation of preliminary information, some 300 drill-hole locations were established along the various proposed routes at approximate intervals of 1,000 feet. Contract drilling started early in September, 1931. To determine sub-soil conditions to a suitable depth below the proposed canal bottom, all drilling, except in rock, penetrated to a depth of minus 50 feet, with reference to mean low water at Sandy Hook, New Jersey.

Two men, a driller and helper, operated each drill rig under the supervision of a foreman who had complete charge of all drilling. Also, to assure accurate results, a qualified inspector accompanied each drill crew to take samples and record ground water observations. Trucks were used to move equipment and serve drill operations.

In drilling, crews used light portable rigs, driven by 3½- to 5-horsepower gasoline engines, and sank 2- to 3-inch casings by means of 250-pound hammers and chopping bits equipped with water jets. At each change of ground and after carefully flushing the drill hole to remove all foreign matter, samples were taken by driving a "sample spoon," a hollow cylindrical tool about 2 inches in diameter by 2 feet long, into the undisturbed earth below the bottom of the casing. Comparative wet samples, collected from the wash water, were found unsatisfactory and misleading, owing to the disintegration of various sub-soils during the process of drilling, to-

● *Sub-soil exploration, on Crab Island in the Raritan River near the Sayreville dam and locksite, was carried on with a diamond drill.*

(*Continued on Page 354*)

Old Times and Old Timers

Written 50 Years Ago

OUR OLD FRIEND, George Williams, dug up for us this interesting, ancient letter from J. R. Penberthy, Master Mechanic for early-day shovel builders, Wilcox and Stock. J. R., better known as Jim, was a brother to the Penberthy who invented the injector of that name.

Building steam shovels was an infant industry in 1883, and Master Mechanic Penberthy not only was in charge of manufacturing, but seems also to have been the designing engineer. Those were the days when the machine was built first and the blue prints made afterward. But let's get to the letter. Here it is . . . the original is, of course, in Mr. Penberthy's own handwriting . . . no typewriters in those days.

Toledo, Ohio
Feb. 23, 1883

George Williams, Esq.
Mandan, D. T.
Sir:

"In answer to yours of the 18th instant, was glad to hear from you. Also glad to know you are doing well by yourself and by the machine. No doubt but our machine is the best in the market today, none excepted. We are building one of all iron to send to the Railroad Exposition to be held at Chicago, and we are going to take the first prize. I have invented a new swinging machine. It is placed on top of the house, not a gear wheel connected, or drums. It can be worked by steam or air—air is more preferable for winter use to avoid freezing. Every person that has seen the thing is in love with it. It is so simple, you can swing the crane as fast or as slow as you like, and stop it at any point and hold it with your little finger. The lever that works it is only 8 inches long. We have no cuts as yet of it. When I get some, I will send you one. I will make a good steam shovel before I get through. Mr. Stock or Wilcox do not interfere with me at all. My crane engines work like little charms. You would not know our shovel if you saw it, it is so changed.

"All our shovels are laid up and all the boys are here. Tripp, Feemeys, Harris, and all the old boys.

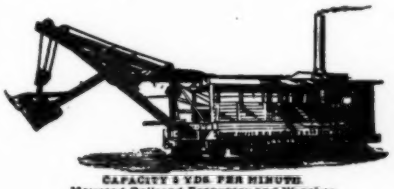
"We have had a flood here again. The water was 4 feet deep in our office. It was worse than it was two years ago. All the bridges across the river with the exception of the Lake Shore are gone.

"Tell Mr. Bellows Fogarty that I intended to be up there before now but I have been very busy getting out this new machine and could not get away. Will be there soon.

"I sent the flue expander yesterday. Remember me to all. Write again.

"Yours,
"J. R. Penberthy.

"P. S. Ask Doran if he has any specimens for me. I am coming for them. Remember me to him."



CAPACITY 3 YDS. PER MINUTE.
Mounted Railroad Excavator and Wrecker.
PATENTED:
No. 104,178 Dec. 14, 1870.
No. 124,108 Nov. 21, 1872.

Reproduced here is an illustration of the Wilcox & Stock machine from the letterhead on which the above was written. Many thanks to Old Timer Williams for this excellent contribution.

Did You Help Run "Greasy Mary" in 1913?

Back in 1913, at Soldier's Summit, Utah, the Utah Construction Company had a Bucyrus 70-C railroad type shovel which was known among the gang as "Greasy Mary." On that shovel worked two men, Jesse Palmeter and Les Munson. We were talking to Les the other day and he said that he would like to get in touch with Jesse Palmeter—that old friend of 22 years ago.

Can any of our readers tell us whether Jesse is still alive, and if so, where he is living? Drop a line to OLD TIMER, EXCAVATING ENGINEER, South Milwaukee, and we'll see that Mr. Munson gets the word.

Calling the Roll

LOTS OF Old Timers' names are mentioned in this letter from Fred Nichols, now of Los Angeles, California. Maybe you'll recognize some of them.

"An Old Timer (*William Durant*) sent in pictures of an old Model G Marion and an improved A Marion used on the Scully Yard job by the T. A. Gillespie Company, with John Duffy as Master mechanic. (*Excavating Engineer, August, 1934*). I think I craned both of those rigs on the filtration plant at Aspinwall, Pa., for the T. A. Gillespie Co.

"They also had a Vulcan shovel on the job. The runner was Whitey Brubaker. The craneman was named Collins. Later Joe Donovan took the machine; George Nichols was the runner on the improved Marion, and I was the craneman. I have forgotten the names of the day crew on the Model G Marion; they went to the Canal Zone. Jimmie Keeley ran the 'G' at night. I also craned for him later. Mike Coffee was the BIG SHOT. Larry O'Toole was the General Superintendent; Jimmie Foley was timekeeper or paymaster, and a brother to Billy Foley of Foley & Sons, Contractors. Billy Woods was foreman; and there were other Old Timers too numerous to mention.

"This job was a very important one, and employed a very large number of men, most of whom were Old Timers then. The time was 1905 to 1908, I think. Of course, quite a few of the old boys have passed on, as well as my Father, who stayed to the end. I hope they are happy on their Bucyrus 65's, old 70-tonners, 45's, 95's; with a good fireman who can keep her up to the peg and not let her pop off; a craner who won't talk back; a good reliable pit gang; a super who doesn't throw his hat down and jump on it; a dinkeyskinner who can spot a train without a dumb brakeman; a set of dipper teeth that never get dull; and last, but not least, a powder monkey who can shoot a shot and not leave it for the old boys to dig out with the shovel."

Thanks, Old Timer Nichols, for your interesting letter.

EXCAVATING ENGINEER
FOUNDED 1906

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Editor

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The Business Situation

THE MOST impressive feature of business conditions at the moment is that there seems to be lacking only one factor to sweep this country into a period of prosperity. We have accumulated, during the past few years, an enormous shortage of goods of many kinds as well as an enormous demand for new construction, both residential and otherwise. There are tremendous reserves of idle credit which await only one thing to put them to work.

The one thing lacking is, of course, confidence. The very definite character of the Supreme Court decision in regard to the Recovery Act would have been a very decided builder of confidence had it not been that the actions of Congress during the next few weeks again raised doubts in the minds of business men as to whether it was going to be possible to operate on a money-making basis.

In this country we hear so much about the efforts to achieve a managed recovery that we are inclined to forget that there are natural forces which generate recovery following a period of depression. We sometimes overlook the fact that plans laid to hasten a managed recovery oftentimes become barriers which prevent the proper operation of the natural forces.

Let's see what natural forces have done in other countries. For a number of years now, the League of Nations has maintained statistical indexes of industrial production for a number of nations. By means of them, it is possible for us to compare our industrial recovery with the recoveries of certain other nations. If we take June, 1933, as a base and compare, with the industrial activity at that time, the industrial activity enjoyed by each country on the date for which the latest statistics are available (in most instances for March of this year) we find, that of twenty countries, the United States is next to last in the degree of improvement shown in that period of approximately two years. The tabulated list is as follows:

Sweden	+41
Hungary	+33
Italy	+31
Germany	+26
Chile	+24
United Kingdom	+20
Russia	+19
Roumania	+19
Japan	+17
Greece	+17
Canada	+17
Finland	+14
Austria	+10
Poland	+ 8
Czechoslovakia	+ 8
Netherlands	0
Norway	— 1
Belgium	— 3
United States	— 9
France	—16

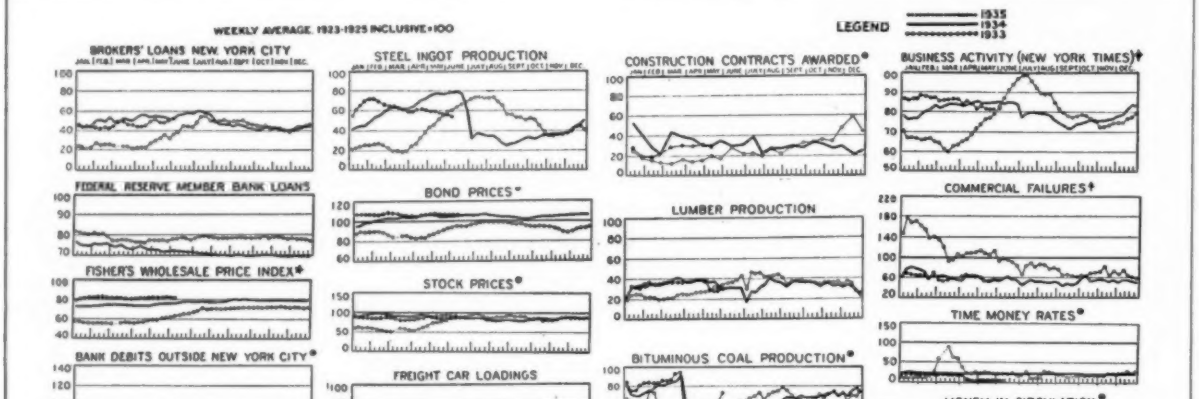
The figures given are percentage change in volume of industrial production from June, 1933, to the month for which the latest figures are available.

Another striking feature of the past two years is that the automobile industry has led all others in improvement in business during the period.

At the present moment that industry is back to practically 80% of its 1929 average. This is a very remarkable record and is, apparently, a direct result of improvement in design and styling and, more important still, the lowering of manufacturing costs to permit the sale of modern, striking machines at a much lower price than ever before possible.

It has been said that our country cannot experience recovery without increasing activity in the construction industry—an activity supported by private investments in capital goods. Such improvement has so far failed to

WEEKLY BUSINESS INDICATORS



materialize in the manner necessary to instill confidence of a sustained upward trend, but in the last few months there has been a very marked upturn in the building of residences from a low which has persisted for almost two years.

This upturn is shown in the latest F. W. Dodge Corporation's report which states:

"Residential building continues to reflect encouraging improvement. For the initial half of May, contracts let for this class of construction were approximately 80 per cent ahead of the total shown in the corresponding period of May 1934. For the 37 states east of the Rocky Mountains, a residential building total of $22,072,500 is reported for the first 15 days of May; during the first half of April the total was $20,610,900 while for the initial 15 days of May, 1934, the volume was only $12,421,500.

"The contract total for all classes of construction inclusive of residential building amounted to $60,961,300 for the initial half of May as against $61,969,900 for the first half of April and $67,181,400 for the first 15 days of May 1934.

"The April construction contract volume exceeded the total for March by a small margin. A loss from the volume reported for April of last year was shown, however, due to a falling-off in awards under the old PWA program. April contracts totaled $124,098,000 as against $122,940,500 for March and $131,157,000 for April, 1934.

"Gains in residential building were shown in April in each of the principal geographic territories as compared with last year except for the New England and the New Orleans areas. Residential contracts let during the first four months of 1935 in the 37 states totaled $113,517,200 as against only $80,342,500 for the corresponding four months of 1934."

"This improvement over a year ago in residential building bids fair to continue for the remainder of the current year judging from the figures on contemplated projects. Contemplated residential building reported in April amounted to $99,721,900 as against only $54,483,000 for March and $55,074,300 for April of last year."

Alan MacDonald

ALAN MacDonald, 53, died June 7 of a heart attack in Los Angeles where he was vacationing. He was vice president of MacDonald & Kahn, Ltd., well known construction firm on the West Coast.

Mr. MacDonald was born in Louisville, Kentucky. Upon graduation from the engineering school of Cornell University, he went to San Francisco, California, and entered the contracting field. He built a number of important buildings in San Francisco, among them the Hotel Mark Hopkins, the Fox Theater, and the Financial Center building. He later became a director of Six Companies, Inc., now engaged in building Boulder Dam.

Mr. MacDonald is survived by his widow, Suzanne K.; son and daughter, Graeme and Suzanne; his father, Kenneth MacDonald; and two brothers, Graeme of San Francisco and Kenneth of Los Angeles.

William Rosewater

ON MAY 25 at Salt Lake City, Utah, William Rosewater, widely known consulting engineer, passed away at the age of 64 years. He became ill while on a business trip to that city from his home in Los Angeles.

Mr. Rosewater was well known among dredge users, having spent most of his life designing, building, and operating this type of excavating machinery. He came with Bucyrus-Erie company in 1899 and was with them, except for one brief period, until 1917, when he left to go to the General Development Company on some dredge work in Colombia, South America. He is survived by his wife, Eva, one sister, Mrs. Walter Patek of Los Angeles, and three brothers, Edward, Arthur, and Harry of Cleveland, Ohio.

Ancient Ways in Modern Days

AT TINK TUA, Tonkin tin mines at Wolfram, Indo-China, the ore is dug by hand and placed in the crude timber trough. Water and gravity then move the ore down to the plant in the valley. Methods very similar to this for conveying material have probably been used in China for many centuries. Most of the laborers are protected from the sun by wide straw hats, but one "shovel" man seems to have gone modern and works under an umbrella.

Field Notes

What Diameter? What Pressure? How Many Pounds of Steam?

THIS CHART answers all of the above questions. It will be found very useful for making calculations regarding steam flow, steam pressure, and diameter of opening or diameter of short pipe for a given condition where there is at least 60 per cent pressure drop through the opening.

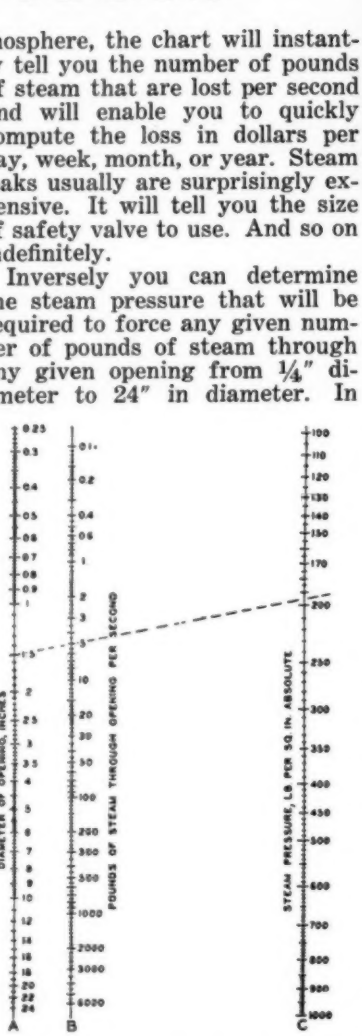
For example, if you carry steam at a pressure of 195 lbs. per square inch absolute, and you figure that it will take 5 lbs. of steam per second to handle a given task or to heat a given building, the question is "What must be the diameter of opening or short pipe to permit 5 lbs. of steam to pass into the machine or heating coils per second?"

A heating problem is a good one to use because it usually involves considerable pressure drop. Very often the pressure drop is effected through a reducing valve. Where a reducing valve is used this chart comes in handy for determining the size of valve required. In other words the opening through the reducing valve must be large enough to conduct 5 lbs. of steam from the boiler into the machine or heating coils per second.

The dotted line which I have drawn across the chart shows how easily these problems are solved. Simply run a straight line through 195 lbs. per sq. in. (Column C) and then through the 5 lbs. steam per second (Column B) and the answer is 1.5 inches, (Column A). That is, the diameter of opening, orifice, or short pipe, whatever you wish to call it, must be at least one and one half inches. Isn't that easy enough?

There are many other places where this simple chart will come in handy. For instance, if you have a soot cleaner on your boiler, the chart will tell you the number of pounds of steam being used per second by the cleaner in cleaning the boiler tubes. If you burn oil and use a steam jet burner, it will give you the number of pounds of steam per second used by the burner, knowing the steam pressure and the diameter of opening. If there is a hole in a pipe, fitting, or elsewhere, and steam is leaking out into the atmosphere, the chart will instantly tell you the number of pounds of steam that are lost per second and will enable you to quickly compute the loss in dollars per day, week, month, or year. Steam leaks usually are surprisingly expensive. It will tell you the size of safety valve to use. And so on indefinitely.

Inversely you can determine the steam pressure that will be required to force any given number of pounds of steam through any given opening from ¼" diameter to 24" in diameter. In



other words knowing any two factors in any of the three columns you can immediately determine the unknown factor in the third column. Pressures, as you will note, range all the way from 100 to 1000 pounds per square inch absolute.

To convert absolute steam pressure into "gauge pressure", simply subtract 15 lbs. from the figures in Column C. Thus 195 lbs. absolute is equal to 180 lbs. gauge. 250 lbs. absolute is equal to 235 lbs. gauge, and so forth.

— *W. F. Schaphorst, M.E.*

Handy Shot-firing Cable Reel

A RECENT civic improvement project, involving the use of explosives, required the firing of a great number of holes electrically. To aid in making the

electrical connections, the cable reel, illustrated here, proved extremely handy for holding the 500-foot length of duplex lead wire which was used. The wheels and axle were salvaged from an old buggy. The handles were made of ¾-inch pipe, while the reel proper was a discarded electric cable reel of suitable size. The reel holds 500 feet of rubber-covered, No. 12 duplex cable, the inner end of which is permanently attached to a heavy-duty plug or outlet in the side of the reel. This makes it unnecessary to unreel the entire length of cable to connect with the end. Instead, the operator may leave the reel wherever it is most convenient or best protected, and make connection by way of the outlet. One man can easily move the reel about and take care of the laying out and rewinding of the shot-firing cable.

— *The Explosives Engineer*

Coal Given Identity by Special Color

TO IDENTIFY their product and to permit the buying public to distinguish it from other coals on the market, the Pittsburg & Midway Coal Mining Company are now spraying screened coal with a liquid which gives it a greenish gold hue. This company, operating in the coal region around West Mineral, Kansas, is the first one in that section to develop an identification process to distinguish their product from that of other producing companies. The coal, coming from the mine, is screened and impurities removed by floating the coal in a liquid which has a density slightly greater than that of pure coal, but less than that of slate. The impurities sink, allowing the clean coal to be removed from the top of the separator. The refined coal is then sprayed with a liquid made from a secret formula whose ingredients do not detract from the heating qualities of the

(Continued on Page 355)

EQUIPMENT
You Ought to Know About

General Electric Shot-Firing Cords

TWO NEW types of all-rubber shot-firing cords, both of which because of their small diameter, flexibility, and light weight are of particular interest to the operator who is required to carry long lengths on the job, have been announced by the General Electric Company's Merchandise Department, Bridgeport, Connecticut. One of the new items is a round-type, the other a parallel-type cord. The round-type cord is especially suitable for battery shooting in damp and wet places. Its all-rubber construction makes it resistant to abrasion and mechanical injury, as well as to the action of oil, acid, and gas. The parallel-type cord is of flat all-rubber construction. As a result of the simple construction and high-grade materials used, this cord will provide satisfactory service under ordinary conditions where initial low cost is a deciding factor. A red rubber finish serves as a distinctive identification for these two types of shot-firing cords.

Heavier Churn Drill

THE 29-W, a larger and more powerful addition to the well-known Bucyrus-Armstrong line of churn drills, has just been announced by Bucyrus-Erie Company, South Milwaukee, Wisconsin. The 29-W is designed to meet the demand for a modern, all-steel, wire-line machine capable of drilling depths of 1500 feet or more, and starting up to 20-inch holes. This machine has been thoroughly tested in the field by owners, who report speed and economy far beyond their expectations.

The new machine is fast and economical to operate. Its strong, all-steel construction enables it to handle a heavy string of tools, with a minimum of maintenance. The saving of time and expense in moving and rigging up, as compared with the standard rig or the ordinary portable machine of this type, adds very considerable economies, and lowers drilling costs.

The 29-W weighs approximately 15,000 pounds without tools, and may be mounted on a motor truck, or trail behind the truck on pneumatic-tired wheels as a two- or four-wheel trailer unit. Regular steel-wheel mounting is also available for use, when moving with horses or tractor. The new drill can be furnished with caterpillar type mountings which add approximately 6,000 pounds to the weight of the machine. The 29-W is especially suited for deep prospect drilling, sinking mine ventilation holes, and drainage holes.

Allis-Chalmers Speedster

A NEW TYPE of high-speed dirt hauling unit which has for several months been put through rigid tests by contractors, is now announced as ready for distribution by the Allis-Chalmers Tractor Division, Milwaukee, Wisconsin. A growing demand among dirt movers for higher speed hauling equipment, combined with far-reaching advancements in the use of low pressure pneumatic tires, is said to have inspired the idea of this new way to move dirt.

Known as the Speedster because of its ability to haul 6 to 8-yard loads at speeds ranging up to 16 miles an hour, the new unit is a definite departure from conventional hauling equipment. It is a single-unit outfit, consisting of trailer-type wagon and tractor, with four big, low-pressure tires, 18"x60", and two smaller tires.

The Speedster's ability to "turn on a dime," at greater than 90 degree angles, is another unusual feature. A high arch provides clearance for the tractor to undercut, and to turn in its own tracks for quick, accurate spotting under dipper or grader. Steering is assisted by independent clutches and brakes.

One man operates the entire unit. Braking, dumping and winding operations are vacuum-controlled from the tractor dashboard. The all-welded design produces maximum strength with minimum weight and the torsional-tube main frame eliminates twisting strains from the body. A wide, unobstructed, bottom-dumping mouth discharges loads instantly. The open-hopper top has a reversible side for low loading operations, when needed. Anti-friction bearings are used throughout.

Diesel-Powered Mine Locomotive

THE RUTH Company, Denver, Colorado, now has available a Diesel-powered locomotive for use in underground mining operations. The locomotive, powered by a 40 h.p. engine, has five speeds in either direction, varying from one to 12 miles per hour with 2000 lbs. drawbar pull. Because of the economies possible with a Diesel-powered locomotive, the manufacturer states the saving in mining cost by the use of this locomotive has tremondous possibilities. Diesel-powered locomotives are especially suitable for underground use due to the absence of the dangerous carbon-monoxide gas. When the locomo-

(*Continued on Page 351*)

SHOTS *from the Firing Line*

Five Hundred Million Dollars Apportioned for Roads and Grade Crossing Work

SECRETARY of Agriculture Henry A. Wallace, on June 4, announced the apportionment among the States, the District of Columbia and Hawaii of $200,000,000 for highways, roads and streets, and $200,000,000 for elimination of hazards at railroad grade crossings under the Emergency Relief and Appropriation Act of 1935. These sums are allocations made by the Advisory Committee on Allocations on May 16 and approved by the President.

The expenditure of the new funds is subject to such rules and regulations as may be prescribed and approved by the President.

The apportionment by Secretary Wallace has been made in accordance with the provisions of law which require that funds for highways and related projects be apportioned on the basis of population, area, and mileage of rural post roads, slightly more weight being given to population than to the other factors. Funds for work at grade-crossings were apportioned, one-half on the basis of population, one-fourth according to the mileage of the Federal-aid highway system and one-fourth according to railroad mileage.

An additional $100,000,000 was allocated by the Advisory Committee on Allocations with which to meet obligations arising from the authorization of $200,000,000 for highways in the Hayden-Cartwright Act and apportioned by the Secretary of Agriculture on June 19, 1934. One-half of this amount has previously been appropriated.

The funds apportioned are not available for expenditure in any State until a program of the projects proposed to be undertaken in the State shall be submitted by its highway department and approved by the Advisory Committee on Allotments.

It is also provided that no individual project will be approved for construction in any State until the highway department of the State has submitted and obtained approval of a program of projects that will absorb substantially all Federal emergency funds previously apportioned.

State	Highways, Roads, and Streets	Highway-Railway Grade Separation and Protection	Total	Unappropriated Balance (Hayden-Cartwright Act)	Grand Total
Alabama	$ 4,151,115	$ 4,034,617	$ 8,185,732	$ 2,129,921	$ 10,315,653
Arizona	2,569,841	1,256,099	3,825,940	1,320,967	5,146,907
Arkansas	3,352,061	3,574,060	6,926,121	1,714,024	8,640,145
California	7,747,928	7,486,362	15,234,290	3,966,103	19,200,393
Colorado	3,395,263	2,631,567	6,026,830	1,743,003	7,769,833
Connecticut	1,418,709	1,712,684	3,131,393	727,434	3,858,827
Delaware	900,310	418,239	1,318,549	461,697	1,780,246
Florida	2,597,144	2,827,883	5,425,027	1,330,671	6,755,698
Georgia	4,988,967	4,895,949	9,884,916	2,556,745	12,441,661
Idaho	2,222,747	1,674,479	3,897,226	1,138,743	5,035,969
Illinois	8,694,009	10,307,184	19,001,193	4,460,700	23,441,893
Indiana	4,941,255	5,111,096	10,052,351	2,544,481	12,596,832
Iowa	4,991,664	5,600,679	10,592,343	2,559,180	13,151,523
Kansas	4,994,975	5,246,258	10,241,233	2,558,837	12,800,070
Kentucky	3,726,271	3,672,387	7,398,658	1,909,155	9,307,813
Louisiana	2,890,429	3,213,467	6,103,896	1,481,966	7,585,862
Maine	1,676,799	1,426,861	3,103,660	855,793	3,959,453
Maryland	1,750,738	2,061,751	3,812,489	905,029	4,717,518
Massachusetts	3,262,885	4,210,833	7,473,718	1,675,237	9,148,955
Michigan	6,301,414	6,765,197	13,066,611	3,226,284	16,292,895
Minnesota	5,277,145	5,395,441	10,672,586	2,712,775	13,385,361
Mississippi	3,457,552	3,241,475	6,699,027	1,770,113	8,469,140
Missouri	6,012,652	6,142,153	12,154,805	3,086,870	15,241,675
Montana	3,676,416	2,722,327	6,398,743	1,884,867	8,283,610
Nebraska	3,870,739	3,556,441	7,427,180	1,982,182	9,409,362
Nevada	2,243,074	887,260	3,130,334	1,151,178	4,281,512
New Hampshire	945,225	822,484	1,767,709	484,731	2,252,440
New Jersey	3,129,805	3,983,826	7,113,631	1,610,440	8,724,071
New Mexico	2,871,397	1,725,286	4,596,683	1,470,850	6,067,533
New York	11,046,377	13,577,189	24,623,566	5,663,961	30,287,527
North Carolina	4,720,173	4,823,958	9,544,131	2,420,471	11,964,602
North Dakota	2,867,245	3,207,473	6,074,718	1,469,484	7,544,202
Ohio	7,670,815	8,439,897	16,110,712	3,932,506	20,043,218
Oklahoma	4,580,670	5,004,711	9,585,381	2,342,590	11,927,971
Oregon	3,038,642	2,334,204	5,372,846	1,548,907	6,921,753
Pennsylvania	9,347,797	11,483,613	20,831,410	4,795,394	25,626,804
Rhode Island	989,208	699,691	1,688,899	507,286	2,196,185
South Carolina	2,702,012	3,059,956	5,761,968	1,385,477	7,147,445
South Dakota	2,976,454	3,249,086	6,225,540	1,523,822	7,749,362
Tennessee	4,192,460	3,903,979	8,096,439	2,151,496	10,247,935
Texas	11,989,350	10,855,982	22,845,332	6,145,627	28,990,959
Utah	2,067,154	1,230,763	3,297,917	1,066,346	4,364,263
Vermont	924,306	729,857	1,654,163	474,004	2,128,167
Virginia	3,652,667	3,774,287	7,426,954	1,882,694	9,309,648
Washington	3,026,161	3,095,041	6,121,202	1,553,206	7,674,408
West Virginia	2,231,412	2,677,937	4,909,349	1,140,168	6,049,517
Wisconsin	4,823,884	5,022,683	9,846,567	2,470,919	12,317,486
Wyoming	2,219,155	1,360,841	3,579,996	1,143,856	4,723,852
District of Columbia	949,496	410,804	1,360,300	474,889	1,835,189
Hawaii	926,033	453,703	1,379,736	486,921	1,866,657
Eng. & Adm. Res.	5,000,000	4,000,000	9,000,000		9,000,000
TOTALS	$200,000,000	$200,000,000	$400,000,000	$100,000,000	$500,000,000

Subject to these conditions the funds are available for immediate expenditure and will be administered through the Bureau of Public Roads. They are to be expended by the State highway departments and it is expected that construction on many projects will begin in the immediate future.

The apportionment is shown in the table on this page.

1935 Relief Act Regulations

THE FOLLOWING information concerning the expenditure of work relief funds as authorized by the 1935 Emergency Relief Act has been made available:

Highway Projects

The following applies to the $200,000,000 allotment for highway projects to be spent under the jurisdiction of the United States Bureau of Public Roads and the State Highway Departments:

1—Partial highway programs may be prepared by states for projects that will use 90 per cent labor from relief rolls.

2—Projects will be measured on rate of $1,400 total expenditure for labor, materials and incidentals per man per year.

3—Projects will be selected where relief labor may be used.

4—Number of relief cases by counties in each state will be given consideration in the location of projects.

5—An estimate of the number to be employed, and cost and character of materials, will be required for each project.

6—Due to the high percentage of direct labor requirements, it would seem advisable to use work relief funds for first stage construction, to be followed by surfacing as regular Federal-aid projects.

7—Not less than 25 per cent of apportionment to be expended for secondary projects.

8—Secondary projects shall be located off state or Federal systems, except where state mileage includes all principal county roads.

Grade Crossing Elimination Projects

The following applies to the $200,000,000 allotment authorized by the 1935 Emergency Relief Act for Grade Crossing Elimination and Protection to be spent under the jurisdiction of the United States Bureau of Public Roads and the State Highway Departments:

1—Regulations will require that 90 per cent of the persons employed on any project shall be obtained from relief rolls.

2—All projects will be measured for approval on a basis of $1,400 total expenditure for labor, materials and

Illustrations at left and center show equipment operated by W. E. Callahan Construction Co. and Gunther & Shirley who have contracts for Sections 1 to 6 inclusive, of the All-American Canal.

At right is a bucket operated by Boyce and Igo, a sub-contractor on Section 3. "HERCULES" (Red-Strand) Wire Rope is on the job.

There is Action on the All-American Canal

Big jobs, hard jobs, and "HERCULES" (Red-Strand) Wire Rope are well known combinations in the construction industry. Contractors have found that the remarkable dependability of this wire rope helps to keep their costs on a lower and more uniform basis.

There are reasons why this is so, and we would be glad to give full particulars to every one interested in reducing and stabilizing their wire rope expense.

And the qualities that make "HERCULES" (Red-Strand) Wire Rope a money saver on the big jobs enable it to work with like economy on the smaller jobs. It is not only able to handle a large tonnage for each dollar of its cost, but its long life makes renewals less frequent.

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Shots From the Firing Line—*Continued*

incidentals per man per year, or, on a basis of 40 per cent of the total cost, including cost of property, to go to labor directly employed on the project.

3—Eligibility of projects will be determined by the following factors:
(a) Estimated number of men to be employed (man hours)
(b) Estimated cost
(c) Quantity and character of materials required for each project.

(The above information must be submitted with all programs.)

4—For all practical purposes, grade crossing projects may be selected entirely with respect to relative traffic hazards and the possibility of providing employment in areas where relatively large unemployment exists.

5—In order to secure fair distribution of benefits to the various railroads in the state, the cost of the project or projects on any individually operated railroad in the state will have approximately the same relation to the total apportionment to the state as the mileage of that railroad bears to the total mileage in the state.

6—Nothing in this method of distribution shall operate to prevent the elimination of hazards at main line crossings of individual railroads which have a relatively small mileage in the state.

Funds apportioned are available to pay for the entire cost of projects of the following character, exclusive of charges for rights-of-way and for property damage:
(a) The separation of grades at crossings
(b) The protection of grade crossings
(c) The reconstruction of existing railroad grade crossing structures
(d) The relocation of highways to eliminate grade crossings.

Winners of the National Safety Competition of 1934

ANNOUNCEMENT of the winners of the National Safety Competition of 1934, in which recognition was given to outstanding safety records attained during the calendar year 1934 by numerous mines and quarries, was made June 4 by John W. Finch, Director, United States Bureau of Mines, Department of the Interior, which sponsored the contest. Three hundred and thirty-four mines and quarries in

State Highway Mileage—1933

Mileage existing at end of calendar year, except as noted[1]

(Compiled from reports of State Authorities)

State	Total rural road mileage on state system a/	Earth road, non-surfaced: total non-surfaced	Earth road, non-surfaced: improved and partly graded	Earth road, non-surfaced: improved to grade and drained	Surfaced rural roads by types: total surfaced mileage	Sub-total: low-type surface b/	Sub-total: high-type surface b/	Sand-clay and top-soil	Gravel, chert, etc., treated and untreated b/	Waterbound macadam, treated and untreated	Bituminous macadam (including penetration)	Bituminous concrete (including sheet asphalt)	Portland cement concrete	Block pavement: vitrified brick	Block pavement: asphalt (c) stone (d) wood (e)	Municipal streets connecting state highways: on system	Municipal streets connecting state highways: not on system	State highways, and state connecting routes	State
Alabama f/	5,550	1,462	765	677	9,130	2,984	1,162	1,085	1,861	-	27	166	175	221	-	-	225	5,777	Alabama f/
Arizona	2,895	707	468	261	2,188	1,951	237	-	1,951	-	-	69	69	143	-	-	27	2,988	Arizona
Arkansas	6,863	1,525	707	818	7,314	5,313	2,005	-	5,313	-	-	-	-	1,015	-	-	-	9,080	Arkansas
California	2/12,566	4,098	3,553	501	6,530	3,543	3,007	-	3,543	-	-	1,289	1,318	2,498	-	-	-	15,576	California
Colorado	9,421	4,330	3,951	379	5,091	4,594	493	66	4,532	-	-	-	15	478	-	-	107	9,528	Colorado
Connecticut	2,206	59	-	59	2,156	1,189	967	-	274	-	915	306	194	526	1	-	144	2,482	Connecticut
Delaware	2/1,142	-	-	-	1,142	572	570	44	528	-	-	93	27	798	6	-	(3/)	1,148	Delaware
Florida	6,347	3,152	2,965	187	3,195	3,672	1,463	-	866	-	25	2,779	195	432	249	(4) 67	-	4,685	Florida
Georgia	8,680	3,501	3,454	48	4,779	2,775	1,984	1,335	761	-	618	492	276	1,806	10	-	-	4,981	Georgia
Idaho	4,616	1,457	999	458	3,179	2,998	185	40	2,958	-	-	27	115	43	-	-	130	4,806	Idaho
Illinois	10,099	515	408	107	9,584	12	9,572	-	11	-	1	5	7	9,320	220	-	640	10,739	Illinois
Indiana	6,939	117	-	117	6,822	3,921	2,901	-	2,901	-	1,321	576	60	3,450	104	-	495	6,926	Indiana
Iowa	7,839	410	358	52	7,429	3,222	4,207	-	3,222	-	-	-	-	4,134	28	-	261	8,795	Iowa
Kansas	8,513	2,996	2,865	131	5,517	3,140	1,376	2,252	1,911	-	-	178	2	1,028	156	-	189	8,562	Kansas
Kentucky	2/7,319	1,333	661	672	5,986	1,462	4,524	-	1,462	-	1,032	205	431	876	9	-	(3/)	7,519	Kentucky
Louisiana	2/5,228	3,552	3,552	221	13,672	3,474	2,198	-	3,474	-	-	12	189	1,473	6	-	(3/)	17,684	Louisiana
Maine	2,087	66	66	-	2,021	1,539	482	-	1,539	-	-	267	-	213	-	(4) 2	202	2,379	Maine
Maryland f/	3,757	-	-	-	3,757	1,761	1,996	-	885	1,116	160	260	1,196	-	1	-	127	3,884	Maryland f/
Massachusetts	2/1,795	-	-	-	1,795	1,502	293	-	1,502	35	145	943	256	177	-	(3) 3	(3/)	1,795	Massachusetts
Michigan	2,666	521	399	122	8,167	4,083	4,084	68	3,941	494	86	493	3,244	11	-	185	339	9,213	Michigan
Minnesota	10/6,742	90	43	51	6,676	4,184	2,512	72	4,092	-	-	80	2,424	3	(9) 5	294	-	6,970	Minnesota
Mississippi	6,096	837	158	669	5,257	4,995	272	1	4,538	-	10	52	44	561	13	-	166	6,260	Mississippi
Missouri	2/12,296	1,474	928	546	10,748	6,995	3,753	-	6,995	-	-	256	53	3,435	19	-	(3/)	12,226	Missouri
Montana	8,093	4,649	4,492	157	3,368	3,219	95	85	3,133	-	-	16	3	25	-	-	157	8,250	Montana
Nebraska	9,177	2,597	1,954	671	6,650	2,980	3,670	-	2,980	-	-	11	14	844	49	-	293	9,770	Nebraska
Nevada	4,007	1,791	1,728	58	2,201	2,152	49	-	2,152	-	-	5	23	20	-	-	27	4,034	Nevada
New Hampshire	2,944	17	5	12	2,911	2,439	472	-	2,345	94	-	144	93	241	-	-	24	3,032	New Hampshire
New Jersey	2/1,872	196	115	81	1,732	116	1,616	-	69	23	7	294	1,301	-	5	11/(Less)47	(12/)	1,676	New Jersey
New Mexico	10,378	7,258	5,180	1,814	3,150	1,014	116	-	1,014	116	-	18	102	-	-	-	195	10,295	New Mexico
New York	13,930	1,661	1,654	27	12,269	1,119	11,130	-	146	273	2,997	1,665	6,750	172	13/(Le)16	-	785	14,656	New York
North Carolina	13/10,184	909	313	596	9,199	5,358	3,841	1,582	3,300	476	108	1,084	2,686	1	13/(We)10	-	893	10,991	North Carolina
North Dakota	7,624	1,991	1,166	825	5,617	5,521	-	-	5,521	-	-	-	1	-	-	-	70	7,624	North Dakota
Ohio	11,867	57	57	-	11,788	5,288	6,504	-	4,255	1,021	1,510	714	2,721	1,993	-	-	1,530	13,375	Ohio
Oklahoma	2/7,482	2,020	1,304	716	5,400	2,397	2,933	-	2,397	-	-	275	1,723	39	-	(12/)	-	7,482	Oklahoma
Oregon	2/4,752	624	275	339	4,112	2,530	1,607	-	2,530	-	-	676	905	-	-	(12/)	-	4,752	Oregon
Pennsylvania 13/	12,306	1,281	1,281	-	11,025	4,703	6,320	-	1,763	2,940	321	401	5,341	152	13/(Le)60 5	1,539	-	13,434	Pennsylvania 13/
Rhode Island	1,082	908	225	183	978	158	820	-	75	82	262	115	192	-	-	50	-	1,126	Rhode Island
South Carolina	9,992	147	103	44	9,782	3,376	6,391	2,040	993	43	74	945	1,947	-	-	-	166	6,125	South Carolina
South Dakota	5,946	1,049	358	691	4,841	4,733	108	21	4,732	-	-	5	183	-	-	62	-	6,003	South Dakota
Tennessee	7,212	739	282	457	6,473	4,014	2,459	-	3,117	897	325	607	1,308	18	(9) 1	-	262	7,979	Tennessee
Texas	19,737	5,589	3,588	2,002	13,417	2,515	11,302	10	2,415	90	5,093	1,771	3,198	52	-	1,098	-	21,031	Texas
Utah	4,993	1,818	784	1,034	2,972	2,212	760	-	2,212	-	-	5	30	-	-	379	-	4,402	Utah
Vermont	1,013	-	-	-	1,013	444	569	-	439	5	-	204	271	-	-	47	-	1,100	Vermont
Virginia	13/8,978	1,301	997	304	7,675	6,114	1,559	937	3,404	1,069	-	795	736	-	-	218	-	9,196	Virginia
Washington	4,955	253	180	73	4,702	2,515	2,187	-	2,515	-	-	138	89	20/994	4	(4) 1	294	5,283	Washington
West Virginia	14/4,048	475	409	66	3,573	1,625	1,948	152	1,450	152	792	165	937	89	-	-	239	4,647	West Virginia
Wisconsin	10,104	628	-	628	9,500	5,042	4,458	47	4,563	472	186	94	4,173	1	-	-	799	10,863	Wisconsin
Wyoming	3,228	813	-	813	2,415	1,968	447	-	1,968	-	-	77	8	-	-	-	28	3,243	Wyoming
TOTAL	21/345,752	73,974	58,822	15,040	271,995	157,995	113,692	11,079	129,814	17,780	20,063	13,478	77,869	2,901	4-22 5-24 159 6-22 23/	12,941	3,613	381,988 24/	TOTAL

Existing mileage in secondary systems under jurisdiction of State Highway Departments, for Construction and Maintenance[25]

State	Secondary rural road mileage, state system	Earth road, unsurfaced: total non-surfaced	Earth road, unsurfaced: improved and partly graded	Improved to grade and drained	Total surfaced mileage	Sub-total: low-type surface	Sub-total: high-type surface	Sand-clay and top-soil	Gravel, chert, etc., treated and untreated	Waterbound macadam (penetration)	Bituminous macadam (including sheet asphalt)	Portland cement concrete	Block pavement: vitrified brick	Block pavement: asphalt (a) stone (b) wood (c)	State
North Carolina	25/46,605	31,131	10,368	20,763	15,682	15,215	467	13,198	1,937	179	131	146	102	91 -	North Carolina
Ohio	26/2,064	962	962	-	1,102	1,102	-	-	1,102	-	-	176	37	- -	Ohio
Pennsylvania	27/20,171	10,493	10,493	-	9,718	8,957	761	-	8,525	142	199	110	347	134 (a) 1	Pennsylvania
Virginia	28/37,008	29,165	28,977	6,178	7,923	7,631	292	6,956	2,047	180	227	3	62	- -	Virginia
West Virginia	29/29,094	25,295	25,295	3,755	3,799	3,799	-	-	3,533	1,254	-	-	209	- -	West Virginia
TOTAL	135,149	96,521	66,595	29,532	38,224	36,440	2,252	17,542	15,540	2,952	721	342	949	135 (a) 1	TOTAL

a/ THIS TABLE DIFFERS FROM FORMER ISSUES BY THE SEPARATION OF MUNICIPAL STREET MILEAGE FROM RURAL ROAD MILEAGE OF STATE HIGHWAYS, AND SHOWS SMALL BY TYPES OF RURAL ROADS MILEAGE ONLY, EXCEPT FOR A FEW STATES AS NOTED.

b/ A FEW STATES, AS NOTED, TABULATE TO SUBSTANTIAL RURAL ROAD MILEAGE.

c/ INCLUDING SAND-CLAY, GRAVEL AND WATERBOUND MACADAM.

d/ INCLUDING BITUMINOUS MACADAM, BITUMINOUS CONCRETE, PORTLAND CEMENT CONCRETE, AND BLOCK PAVEMENT.

e/ INCLUDES LOW-COST BITUMEN ROAD-MIX TYPES.

f/ DATA AS OF SEPT. 30, 1933.

g/ INCREASE OVER PREVIOUS YEAR DUE TO ADDITION BY LAW OF APPROXIMATELY 6,000 MILES OF SECONDARY HIGHWAY TO STATE SYSTEM.

h/ INCLUDING MUNICIPAL STREETS, NOT SEGREGATED.

i/ MUNICIPAL STREET MILEAGE ON STATE HIGHWAY SYSTEMS NOT REPORTED; NOT MUNICIPAL STREETS MILEAGE CONNECTING FEDERAL AID SYSTEM GIVEN AS FOLLOWS: DELAWARE, 15; KENTUCKY, 197; LOUISIANA, 115; MASSACHUSETTS, 290; MISSOURI, 52.

j/ ADDITION OF 9,356 MILES TO STATE TRUNK SYSTEM OCCURRED JAN. 1, 1934, AND HENCE IS INCLUDED IN 1933.

k/ COMPRISED OF 6 MILES OF ASPHALT-BLOCK, 3 MILES OF WOOD-BLOCK, AND 18 MILES OF STONE-BLOCK PAVEMENTS.

l/ MUNICIPAL STREET MILEAGE ON THE STATE TRUNK WERE REPORTED IN WHICH THREE STATES AS FOLLOWS: NEW JERSEY, 437; OKLAHOMA, 180; OREGON, 200. THESE MILEAGES WERE NOT REPORTED BY TYPES AND ARE INCLUDED IN THE TOTALS SHOWN IN THE FIRST COLUMN OF FIGURES.

m/ COMPRISED OF 25 MILES OF ASPHALT-BLOCK, AND 3 MILES OF STONE-BLOCK PAVEMENTS.

n/ INCLUDES 56,806 MILES OF COUNTY ROADS UNDER CONTROL AND SUPERVISION OF STATE HIGHWAY COMMISSION FOR MAINTENANCE AND RECONSTRUCTION.

o/ WOODEN FLOORING ON BRIDGES.

p/ INCLUDES 2,044 MILES OF SECONDARY STATE HIGHWAYS TAKEN FROM COUNTY ROADS FOR STATE CONSTRUCTION AND MAINTENANCE, BUT EXCLUDES 244 MILES OF MUNICIPAL STREETS NOT SEGREGATED FROM RURAL ROADS BY TYPES.

q/ DATA AS OF MAY 15, 1933. ADD ANOTHER 20,171 MILES OF SECONDARY SYSTEM.

r/ INCLUDES 7 MILES OF ASPHALT-BLOCK, 1 MILE OF WOOD-BLOCK, AND 1 MILE OF STONE-BLOCK PAVEMENT.

s/ INCLUDES 37,008 MILES OF SECONDARY SYSTEM OF HIGHWAYS TAKEN OVER TO THE STATE HIGHWAY JURISDICTION ON JULY 1, 1932 FOR MAINTENANCE AND CONSTRUCTION BUT NOT MADE PART OF STATE HIGHWAY SYSTEM.

t/ INCLUDES 29 MILES OF BRIDGES FLOORING CONSISTING LARGELY OF CONCRETE SLABS.

u/ INCLUDES 29,094 MILES OF COUNTY-DIVISION ROADS TAKEN BY LAW INTO THE STATE ROAD SYSTEM AS SECONDARY SYSTEM ON JULY 1, 1933.

v/ INCLUDES 1,509 MILES OF MUNICIPAL STREETS NOT SEGREGATED BY TYPES WHICH IF SEGREGATED RESULTS IN 346,892 AS THE NEW MILEAGE OF RURAL ROADS ON STATE SYSTEMS. SEE NOTES 9 AND 12.

w/ INCLUDED 10 MILES OF WOODEN FLOORING ON BRIDGES, CLASSIFIED WITH WOOD-BLOCK PAVEMENT.

x/ WITH THE 3,042 MILES OF CONNECTING STREETS NOT OF STATE SYSTEM INCLUDED, THE TOTAL MILEAGE OF RURAL ROADS AND MUNICIPAL STREETS ON STATE HIGHWAY SYSTEMS IS 354,292.

y/ THE MILEAGES GIVEN BELOW WILL BE INCLUDED IN TABULATIONS OF LOCAL ROAD MILEAGE ISSUED BY THE BUREAU.

z/ ON JULY 1, 1931 THE NORTH CAROLINA STATE HIGHWAY COMMISSION TOOK OVER THE SUPERVISION OF THE CONSTRUCTION AND MAINTENANCE OF COUNTY HIGHWAYS.

aa/ IN 1931 THE OHIO STATE HIGHWAY COMMISSION WAS AUTHORIZED TO DESIGNATE A SECONDARY SYSTEM OF STATE HIGHWAYS, BY MUTUAL AGREEMENT WITH THE COUNTY COURTS.

bb/ SECONDARY MILEAGE PLACED UNDER THE PENNSYLVANIA DEPARTMENT OF HIGHWAYS, FOR CONSTRUCTION AND MAINTENANCE, IN 1931; MILEAGE REPORTED HERE AS OF MAY 15, 1933.

cc/ ON JULY 1, 1932 THE VIRGINIA DEPARTMENT OF HIGHWAYS TOOK OVER SUPERVISION OF THE MAINTENANCE AND IMPROVEMENT OF THE COUNTY ROADS IN 96 OF THE 100 COUNTIES. IN 1932A ANOTHER COUNTY WERE ADDED TO THE SYSTEM.

dd/ ON JULY 1, 1933, ALL COUNTY-SUBSIDIZED ROADS IN WEST VIRGINIA, WITH MINOR EXCEPTIONS, WERE INCORPORATED BY LAW AS SECONDARY STATE ROADS, AND PLACED UNDER THE JURISDICTION OF THE STATE ROAD COMMISSION.

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Shots From the Firing Line—*Continued*

38 states participated in the competition and notable accomplishments were achieved in the operation of mines and quarries without accidents or with quite low accident rates in 1934. The competing companies were divided into five classes: anthracite mining companies, bituminous-coal mining companies, metal mining companies, operators of non-metallic mineral mines other than coal mines, and quarries or open-cut mines. A replica of the bronze trophy, "Sentinels of Safety," donated by the Explosives Engineer magazine, was awarded to the winning company in each group.

In the anthracite mining group, the winner was the Lawrence mine, in Schuylkill County, Pa., operated by the Harleigh-Brookwood Coal Co. This mine was operated for 727,979 man-hours in 1934 with but 53 lost-time accidents, causing 857 days of disability.

In the bituminous-coal-mine group, the highest award was given to the "C" mine, Superior, Wyo., operated by the Union Pacific Coal Co., which was worked through 225,426 man-hours without a lost-time accident.

Of the metal mines competing, the winner was the East Vulcan mine of the Penn Iron Mining Co., Norway, Mich., which was operated 288,828 man-hours without a lost-time accident.

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In the non-metallic mineral group, first place was given to the LaSalle mine of the Marquette Cement Manufacturing Co., Oglesby, Ill., which was operated through 105,376 man-hours without a lost-time accident.

In the group composed of quarries and open-cut mines, the winner was the Rogers City limestone quarry, Rogers City, Mich., operated by the Michigan Limestone and Chemical Co., which worked 727,503 man-hours in 1934 with no lost-time accidents. This quarry was given the highest award in this group in 1929, 1932 and 1933.

Alcova Dam to be Let July 15

BIDS FOR the construction of Alcova Dam, Casper-Alcova Project, Wyoming, will be received at the office of the Bureau of Reclamation at Casper, Wyoming, July 15.

The principal items of work are: 1,651,300 yards of all classes of open-cut excavation; 935,300 yards of earth fill in embankment; 388,000 yards of rock fill in downstream portion of embankment; and 61,000 yards of riprap on upstream slope.

The work is located near Casper, Wyoming, and must be completed within 930 calendar days from receipt of notice to start work.

Safety Record Maintained

THE RAILROADS of the United States and Canada during the past year established a further safety record of no persons killed or injured and no property damaged in the transportation of dynamite and black powder. The amount of these explosives transported on the railroads was something more than 300,000,000 pounds.

The annual report of the Bureau for the Safe Transportation of Explosives and Other Dangerous Articles, just published, gives these facts and also shows that 1934 was the eleventh consecutive year in which these railroads have carried dynamite and black powder without a person being injured.

This safety record is the result of an intensive campaign of education among railroad employes, manufacturers, and shippers of explosives, and of constant supervision with respect to enforcement of the regulations prescribed by the Interstate Commerce Commission through the carriers' Enforcement Agency, the Bureau of Explosives. Since the inception of the work in 1907 the explosives manufacturers have consistently cooperated with the efforts of the railroads to secure safety in the transportation of explosives.

Grand Coulee Dam Plans Changed

SECRETARY of the Interior Harold L. Ickes, on June 8, announced the signing of a change order under which the Grand Coulee dam contractors will alter the shape of the structure. The order calls for construction of a dam 177 feet high, with foundations of sufficient strength to permit economical construction of a higher dam when deemed advisable, without the necessity of extensive alterations of the original structure.

Engineers of the Bureau of Reclamation estimate that the revised plans will call for an expenditure of somewhat less than was originally contemplated.

New England Notes

By M. E. POAG

Central Construction Company, Lawrence, Mass., was low bidder on a 4.7-mile road project at Andover, Mass., bidding $140,004 on a bituminous macadam surface, and $139,642 on a penolithic surface. This work involves approximately 51,500 yards of excavation.

Carlo Bianchi & Company, Inc., Framingham, Mass., has been awarded the 2.8-mile Billerica-Chelmsford road paving job for $78,471. The work involves 76,600 yards of excavation.

By H. W. LIPSON

Seventeen power shovels, of all makes and sizes, are hard at work on the excavation for the Suffolk Downs Race Track being built at East Boston, Massachusetts. The grandstand, when completed, will be over 600 feet long and have a seating capacity of 16,000. The general contractor is **Joseph A. Tomasello**, Boston, Massachusetts, with Walter Reed as general superintendent. This project has helped in relieving local unemployment for there are approximately 600 men working on this job. In addition to the seventeen shovels, the job requires the services of 180 dump trucks, 4 pile drivers, 16 bulldozers, 2 road graders, and 7 steam rollers. The illustrations below show two of the shovels making the dirt fly. The Bucyrus-Erie gasoline-powered 32-B shovel, in the upper picture, belongs to **C. J. Maney**, Boston. In the lower picture, the Bucyrus-Erie Gas+Air shovel, loading to a Mack truck, belongs to **Carlo Bianchi & Company, Inc.**, Framingham, Mass.

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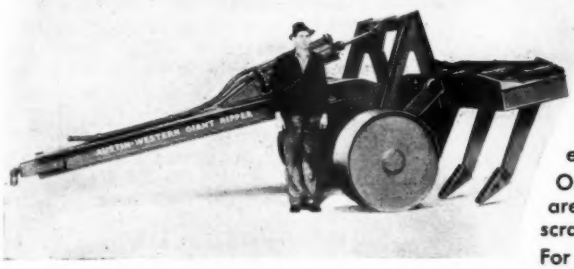

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Shots From the Firing Line—*Continued*

New York Notes

By G. E. PETERSON

Low bidders at recent State Highway lettings have been announced as follows: **Sheehan Contracting Corp.**, Albany, N. Y., $154,145, for 2.71 miles of concrete in Ulster County; **Suffern Stone Co.**, Suffern, N. Y., $30,885, for 2.34 miles of macadam in Orange County; **Chas. Shaffer & Son**, New York, $70,864, for grade separation on the Hutchinson River Parkway in Westchester County; and **Mannino & Pittari**, Brooklyn, $71,630, for drainage work on Grand Central Parkway extension in Queens County.

Low bidders in the Metropolitan Area have been: **DeMarco & Cicconi**, White Plains, $61,278, for trunk sewer in North Yonkers; **Wm. Kennedy Construction Corp.**, Brooklyn, $597,377, for destructor plant at Flushing; **Fred Berlanti & Son**, Harrison, $192,336, for road and sewer in White Plains; **L. I. Waldman Co.**, L. I. City, $101,644, for sewer work in Queens County; **P. Tomasetti Contracting Co.**, Brooklyn, $368,067, for sewers in Queens County; **Tully & DiNapoli**, L. I. City, $395,525, for Bronx piers of Tri-Boro Bridge; **P. T. Cox**, New York, $947,061, for eight grade eliminations on Staten Island; and **Intercounty Construction Corp.**, Rye, $93,908, for sewer work in North Yonkers.

Cornell Contracting Corp., New York, submitted low bid of $2,770,204 for the New York approach to the Midtown Tunnel.

New Jersey Notes

An extensive campaign against the pestiferous mosquito is now under way in this state. Shown here, **Essex County Mosquito Extermination Commission's** Bucyrus-Erie 10-B clamshell machine is cleaning out a portion of Parsons Canal in the flat swampy land adjacent to the American Airlines Airport near Newark. The machine carries an orange-peel bucket and dumps the spoil along the bank. The ground is too soft to permit trucks to approach the machine. Cleaning out the ditch will improve the drainage and eliminate many stagnant pools in which the mosquitoes breed.

Pennsylvania Notes

By D. W. EVANS

One of the five Bucyrus-Erie excavators being used by **Carey, Baxter & Kennedy, Inc.**, on an anthracite coal stripping project near Mahanoy City, is the 52-B Diesel dragline shown above.

Ohio Notes

By H. F. UNGER

A difference of $100,000 between the Public Works Administration allocation and the lowest bid on the Cedar-Central slum elimination project in Cleveland is holding up the awarding of contracts in Washington. The low bid of $2,517,740 submitted by the **George A. Fuller Company** of Washington was $100,000 more than PWA allowed for the construction job. However, government officials have been working steadily on this problem, and hope to arrive at a decision shortly.

An application for a federal grant of **$40,000,000 for a subway** under Public Square, and under Euclid Avenue, from the Square to E. 105th Street in Cleveland has been sent to Washington.

Recommendations have been put before Mayor Davis of Cleveland, that the city begin work on a **$19,000,000** water **expansion program** in the Nottingham district. Under this comes the construction of the long-discussed Nottingham tunnel, 50 feet under Lake Erie and extending five miles out at a cost of $6,000,000, the erection of a $9,000,000 filtration plant to serve the Nottingham district, and the expenditure of $4,000,000 for a pumping station. Five years would be required to complete this work.

The general and excavating contract for the construction of the new auditorium and gymnasium building for Hiram College has been awarded to **William Dunbar Company** of Cleveland, by the trustees of the college. The structure will cost $150,000.

Bates & Rogers, Chicago, Illinois, was recently awarded a contract for the construction of Dover Dam on the Tuscarawas River three miles north-

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Shots From the Firing Line—*Continued*

east of Dover for $957,262. This dam is one of several included in the flood control and water conservation program of the Muskingum Watershed Conservation District. Construction will be of the massive concrete, straight-gravity type. Principal items of work are: 112,000 yards of earth; 37,000 yards of rock excavation; and 102,000 yards of concrete.

Kentucky Notes

J. U. Schickli & Bros., Louisville, are engaged on their $48,000 contract resurfacing Bardstown Road for a distance of about one-half mile near Louisville City limits. Shown here, their Bucyrus-Erie Gas+Air shovel, with George Harden at the levers is tearing out the old pavement. George tells us that this machine has been digging around 500 yards per day in extremely shallow cuts ranging from 6 to 18 inches deep. The new road will be 56 feet wide with a concrete base and a rock asphalt surface. The Schickli firm recently completed a new stretch of roadway along Grinstead Drive at a cost of approximately $78,000.

St. Louis and Vicinity

By A. J. KOENIG

Low bidders, for the construction of an express highway, a super-highway, a belt highway and a supplementary feeder highway in St. Louis and St. Louis County, were announced by the State Highway Commission, June 7, as follows:

The Powers-Thompson Construction Company, Palmyra, was low with a bid of $683,886 for the express highway between Vandeventer Avenue and Skinker Boulevard. This work includes excavating 1.2 miles in the depressed section between Vandeventer and Kings Highway, 6 traffic bridges and a pedestrian bridge over the roadway.

M. E. Gillioz, Monett, was low with a bid of $381,950 for the 6.5 mile superhighway No. 60 between Bellefontaine and the end of Olive Street Road opposite Weldon Springs.

Carlon Construction Company, Maplewood, was low with a bid of $45,701 for the widening of Lindbergh Boulevard for a distance of 0.69 miles.

F. T. O'Dell, Hannibal, bid $167,622 for the construction of 0.29 miles on Telegraph Road, including the relocation of a bridge.

C. H. Atkinson Paving Company, Chillicothe, bid $120,287 for paving 3.06 miles on Telegraph Road.

An allotment of $25,000,000 for the Upper Mississippi River was announced by the War Department. This sum will be used for the construction of **five locks and four dams.** The locks to be constructed will be located at: Red Wing, Minn.; Clinton, Iowa; LeClaire, Iowa; New Boston, Ill.; and Cape Au Gris, Mo. The dams will be constructed at LaCrosse, Wis.; Genoa, Wis.; Dubuque, Iowa; and Burlington, Iowa.

The Digging Demon

Shorter cable overhaul. Exclusive power-arm combination of lever and block-and-tackle, giving unusual digging power. These are reasons why the Williams "Champion" Bucket is a real time saver ... *money maker* ... for users.

THE WELLMAN ENGINEERING CO.
7002 Central Ave., Cleveland, Ohio

WILLIAMS BUCKETS

River Notes

St. Paul District

Bids for the **construction of Lock No. 3**, Mississippi River, about 6 miles above Red Wing, Minnesota, will be received by the U. S. Engineers Office, St. Paul, July 23.

Principal items of work are: 416,500 yards of common excavation; 53,700 yards of excavation in the cut-off channel; 132,000 yards of fill in earth dike; 416,500 yards of fill in the Esplanade and Island embankment.

For complete details of the proposed work and the exact date of the letting, prospective bidders should get in touch with the Engineers Office at St. Paul; St. Louis; Rock Island, Illinois; or Chicago.

New Orleans District

Dameron & Kenyon Company, Port Allen, La., was low with a bid of 10.2 cents per yard, May 31, for the construction of approximately 2,650,000 yards of earthwork in the Bayou Fordoche—Lottie Levee.

Fort Peck Dam Notes

Work is going forward rapidly on Uncle Sam's hundred million dollar Fort Peck Dam. The four big 28-inch 12,500-hp electric dredges with the aid of their booster pumps are pouring some 5500 to 6000 yards of fill per hour into the sides of the dam.

Gravel for the toes of the dam is rolling in from **Becker County Sand & Gravel Company** and **J. L. Shiely Company's** joint operations at Cole where two 8-yard Bucyrus-Monighans are doing the loading.

Mason-Walsh Company have holed through their four pilot tunnels and are just starting ring drilling for the enlargements of their four diversion tunnels. Blaw Knox liner forms are being set up so that concrete lining can follow close behind the excavation. Outlet concreting is under way. A Chain Belt Pumpcrete outfit places concrete in addition to placement by truck-hauled Blaw Knox buckets which are dumped by Bucyrus-Erie and Marion cranes.

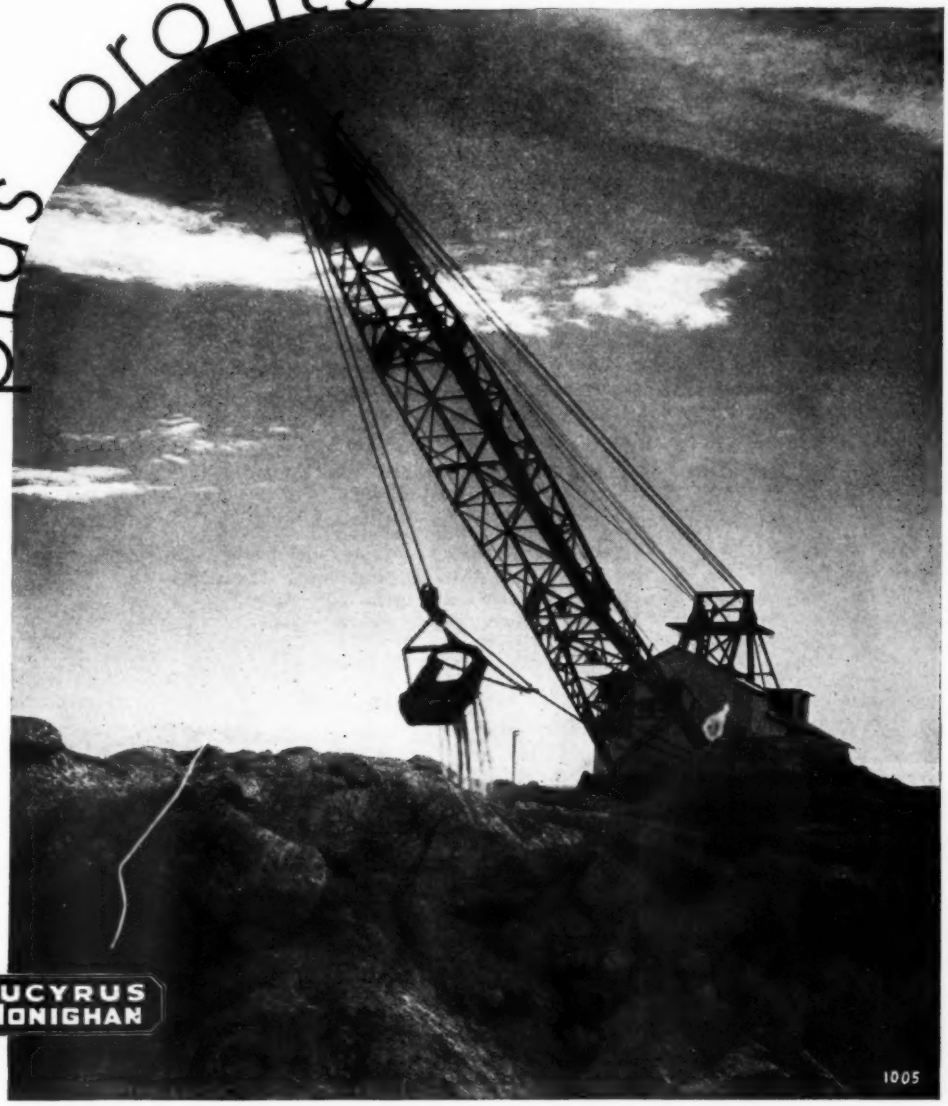
Frazier-Davis Construction Company and **G. L. Tarlton** have practically completed the sheet piling cut off wall down the center line of the dam. Some of this piling was driven 155 feet to reach bed rock.

Spillway Builders, Inc., are cleaning up with two of their Bucyrus-Erie 43-B Diesels in the upper end of the spillway and are cutting off the knob on the lower end of the cut preparatory to benching in. With their five Bucyrus-Eries, four Limas, and a P&H dragline they moved 1,103,000 yards in May; and expect, even with the delay occasioned by moving in on the new section, to run over a million in June.

Martin Wunderlich is making excellent progress on his section of the spillway with his battery of Limas and

FAST, smooth operation ... plus minimum moving time; plus Diesel or electric economy; plus ability to operate over rain-soaked soil... soft, uneven, or obstacled ground; plus long life; plus low initial cost... add them all and you've got Bucyrus-Monighan high output with low costs. If you've a dragline job, there's a fast-digging Bucyrus-Monighan walking dragline that will help you make plus profits. Manufactured by Bucyrus-Monighan Company, Chicago, Illinois.

plus profits



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EXCAVATING, DRILLING, AND MATERIAL-HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN

For your convenience in writing to Bucyrus-Erie Company, you will find a card bound in this issue.

Shots From the Firing Line— *Continued*

Euclid hauling equipment. Superintendent Foster expects to be cleaned up by August 20 if his luck holds good. The Wunderlich organization is moving 12,000 yards a day at present with three shifts.

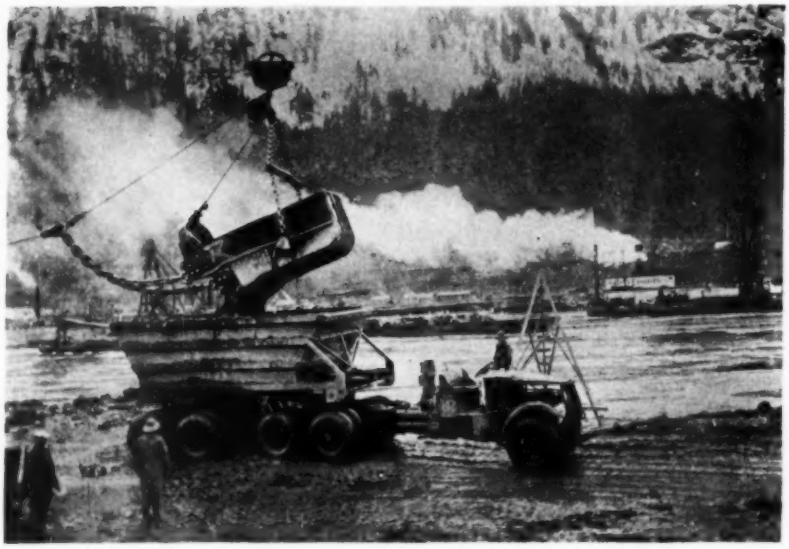
Addison-Miller, Inc. and **Fielding and Shepley, Inc.**, are just moving in on their contract for erecting the spillway gate and cut-off structure.

Frazier-Davis Construction Company and **G. L. Tarlton, Inc.**, St. Louis, submitted low bid of $449,275 May 31 on schedule one which covered the furnishing and driving of 335,000 square feet of steel sheet piling for the lower walls of the closure section of the dam.

Siems-Helmers, Inc., St. Paul, were low on the same date with a bid of $469,698 on schedule 2 which covered the furnishing and driving of 410,000 square feet steel sheet piling for the upper walls of the same section.

Montana Notes

The Bureau of Reclamation will receive bids July 8 at its Fairfield, Montana, office for the **construction of earth work and structures** in connection with the Sun River Project. The principal items of work are: 186,000 yards of all classes of excavation for canals and laterals; 25,000 station yards of overhaul; laying 2,584 linear feet of 15- to 30-inch diameter concrete pipe; laying 1,324 linear feet of 15- to 30-inch diameter corrugated metal pipe; and installing 52,500 pounds of gates and miscellaneous metal work. The work is located near Fairfield and Ashuelot, Montana, and must be completed within 320 calendar days from the date of receipt of notice to start to work.



Bonneville Dam Notes

The illustration above shows what might be termed the World's largest dump truck unit being loaded by **Columbia Construction Co's.**, 6-yard Bucyrus-Monighan electric, walking dragline. **61 tons of muck** are hauled in this 35-yard Le Tourneau buggy mounted on a Mack tractor unit. The utility of this unit lies in its speed—25 miles an hour on return trips—which enables it to make more trips per day. The unit rides on 26 tires.

Utah Notes

The Bureau of Reclamation will receive bids July 8 at its Ogden, Utah, office for the **construction of earth work, canal lining, and structures** on the Ogden River project. The principal items of work include: 163,100 yards of all classes of excavation for canal; 6,580 yards of all classes of excavation for structures; 31,350 yards of backfill; placing approximately 10,000 yards of concrete; and laying pipe ranging from 4-inch to 36-inch in diameter. The work is located near Ogden and must be completed within 320 calendar days from date of notice to start to work.

California Notes

By H. L. LIVINGSTON

The following contracts have been awarded by the California Division of Highways: **Sharp & Fellows Contracting Co.**, Los Angeles, $86,266, for 3.6 miles of grading and road mix surfacing in Orange County; **Frederickson & Watson** and **Fredrickson Bros.**, Oakland, $35,554, for 2.8 miles of grading and stone-surfacing in Alpine County; **Charles L. Harney**, San Francisco, $20,936 for .1 mile of widening and concrete paving on Fifth Street, San Francisco; **Valley Paving & Construction Company**, Fresno, $44,036, for 1 mile grading and asphalt concrete paving in Merced County; **Kennedy Construction Co.**, Oakland, $36,202, for 2.1 miles grading and surfacing in Mono County; and **Griffith Company**, Los Angeles, $39,544, for 1.4 miles grading and paving in Orange County.

The County Board of Supervisors, Los Angeles, has appropriated $10,000 for **additional tests of material** at San Gabriel Dam No. 1. They have also authorized their Chief Engineer to employ a consulting board of three engineers to study the revised plans and specifications for the construction of this dam.

The California State Assembly has approved a bill which will provide $400,000 to **construct check dams, silt dams, and catch basins** on the Santa Ana River in San Bernardino County.

The Flood Control Committee of the House of Representatives at Washington, D. C., has approved an **allocation of $67,152,000** to Los Angeles County to finance various flood control projects.

The **R.F.C. will purchase $36,000,000** worth of Metropolitan District bonds, the proceeds of which will finance a 237-mile power transmission line from Boulder Dam to various pumping units, also preliminary work on Cajalco Dam, five Aqueduct pumping plants and preliminary work on 150 miles of pipe lines to distribute water from Cajalco Reservoir to each city in the Metropolitan Water District.

T. E. Connolly, San Francisco, was awarded a contract for $503,145 by the City of Eureka for constructing the Head Works Unit involving a concrete arch dam on the Mad River and two tunnels.

HELP *for dragline men*

IF you use chain you need these links and rings, which the many enthusiastic owners say are indispensable. The BECO Link permits quick repair of broken chain and fast connection in chain rigging. The BECO Ring revolves, spreading wear around its circumference — allows free movement of chain and sets itself for direct line pulls. You need them — they'll save time and money. Order them today!

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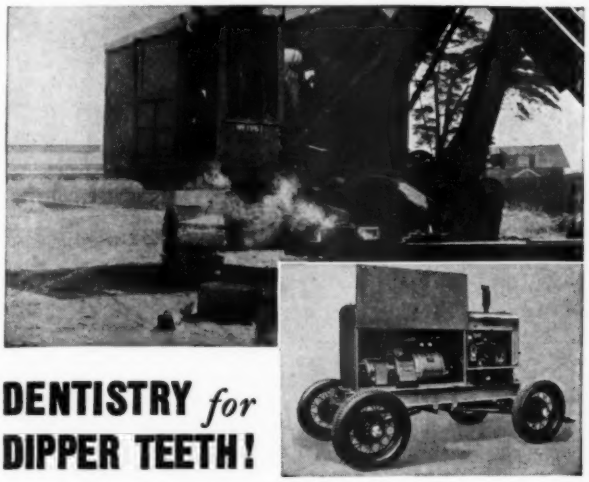

DENTISTRY *for* DIPPER TEETH!

Crack! Your dipper bites into a hidden rock and off comes a piece of tooth! Trot up your P&H-Hansen and it's back in a jiffy. Painless, too, because it doesn't hold up work all along the line. You can fix broken parts, build up worn parts, make new parts easily and quickly with a P&H-Hansen. Keep your equipment on the job! You can do your own welding on bridges, culverts, tanks, etc. That's why more and more wise contractors are buying them. Investigate! Ask for Bulletin HW-3.

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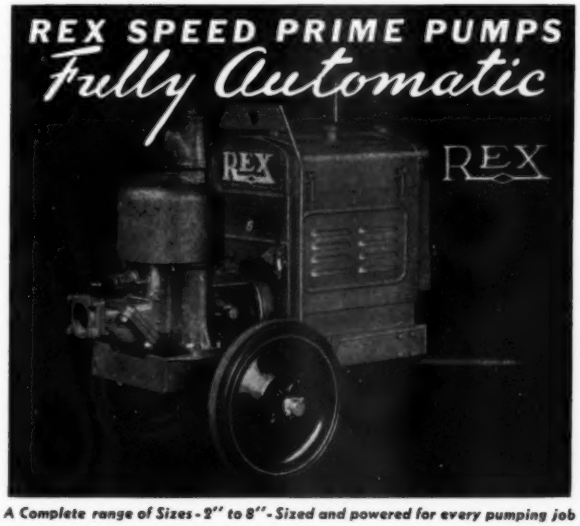
BACKED BY 50 YEARS OF EXPERIENCE



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THE MOST FOOT GALLONS PER HOUR — PER DOLLAR OF COST — FOR PUMP — FUEL — LUBRICATION AND LABOR
SIZE FOR SIZE
POWER FOR POWER
LIFT FOR LIFT

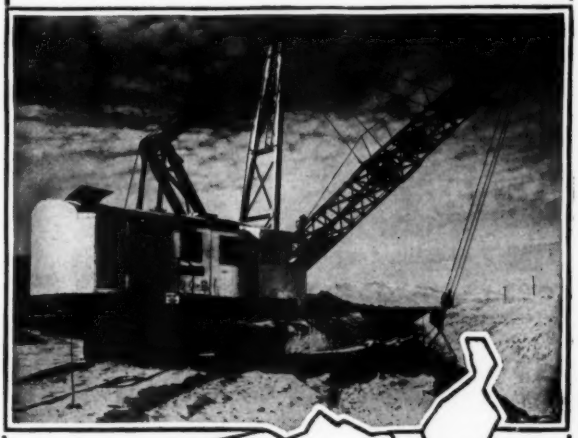
Get 1935 Prices

Carried in Stock in 50 Cities

Send for full information.

CHAIN BELT COMPANY
1652 W. Bruce Street, Milwaukee, Wis.

● *This Bucyrus-Erie model 100-B Electric Dragline is operating on the Colorado River Aqueduct of the Metropolitan Water District of Southern California.* Powered by Westinghouse.



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—— for Shovels with (W) Electric Drive ——

Whether your shovels are at work in Pennsylvania's anthracite fields or in the copper mines of Colorado . . . they are always within over-night distance of *Westinghouse Service.*

Westinghouse service shops, 36 in all, are strategically located throughout the country. Manned with factory-trained experts and equipped for speedy, efficient work, they are ready day or night to make repairs when you need them most.

Remember, when you buy *Westinghouse* electric shovel drive, you not only get equipment that is built for tough jobs . . . you also know that expert service is never more than a few hours away.

Service from Coast to Coast

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Westinghouse
ELECTRIC SHOVEL DRIVES

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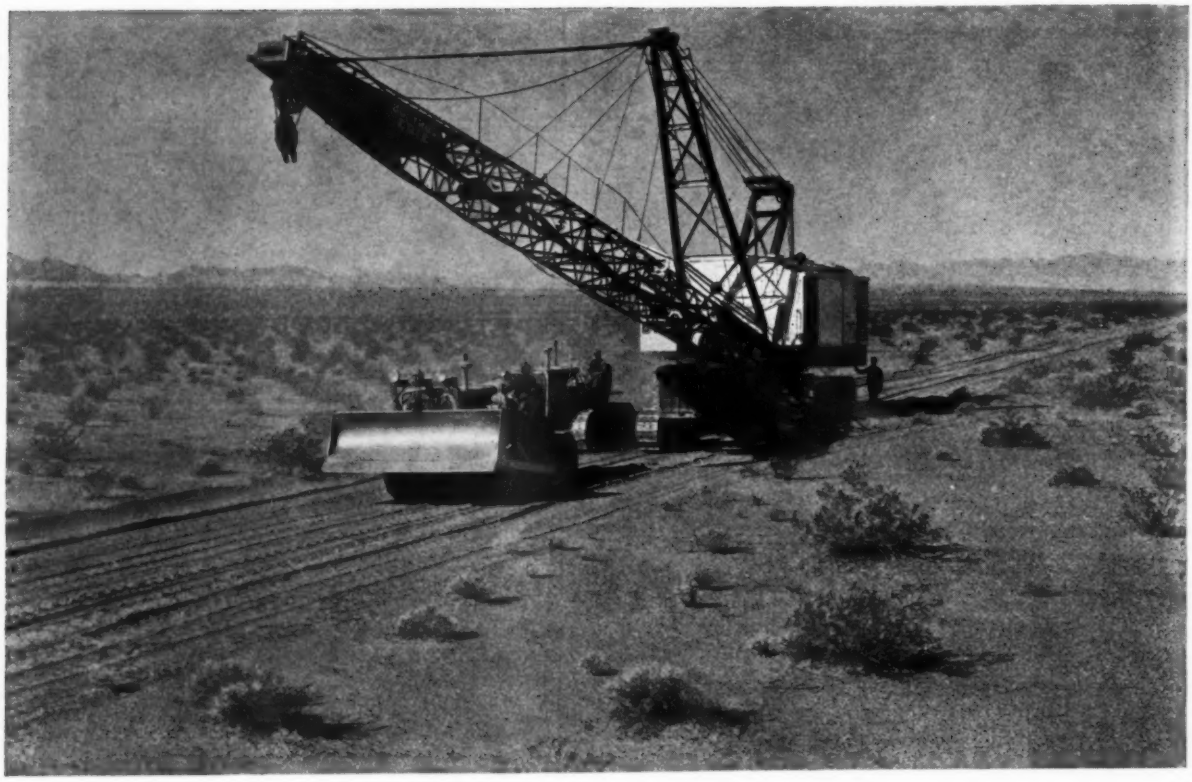


Southern California Notes

By K. CAMPBELL

The Southern California Roads Company has started excavation on the El Modena cut-off, between Figueroa and Colorado Boulevards, in Los Angeles. The project includes a 45-foot pavement and will cost $51,481. This company was recently awarded a contract for paving Sepulveda Boulevard from Ventura to Sunset Boulevards, at a cost of $271,663. This road will be a short cut from the valley towns to the sea.

Matich Bros., Riverside, have completed 90 per cent of their road straightening and widening project between Beaumont and Palm Springs. Dangerous dips in this highway have been filled in and re-paved.

Ducey and Atwood, Pasadena, have completed excavation and have commenced paving of the one and one-fourth miles of highway No. 66 at the eastern edge of Pasadena. It is to be a 45 foot road and contract price was in the neighborhood of $45,000.

Bids are soon to be advertised for **an additional 2,000 feet of breakwater** in Los Angeles Harbor. An allocation of $1,000,000 for this work was made under the recently enacted National Work Relief Act. Plans for the additional section of breakwater have been completed here under the supervision of Major H. H. Stickney, U. S. Engineer. The project is expected to be under contract and ready for actual start by July 20. The new segment of breakwater will extend westerly from the 5400-foot section recently completed. If another allocation, which is anticipated, for an additional 5100 feet of breakwater is made, a gap of only 2225 feet will be left between this line and the breakwater which angles out from the San Pedro shore. This gap will form the entrance through the breakwater system into the outer harbor, access to which is also available around the east end of the breakwater line.

All American Canal Notes

The Bureau of Reclamation will receive bids July 8 at its Yuma, Arizona, office for the following: **stripping 60,000 yards** of overburden from gravel deposits; and preparing and stock piling **320,000 yards of sand and gravel.** The work is located near Yuma and must be completed within 400 calendar days from the date of receipt of notice to start to work.

Colorado River Aqueduct Notes

By K. CAMPBELL

Work on Parker Dam has been **suspended indefinitely** pending further word from Washington.

All **siphon, conduit and canal work** on the east end of the project was shut down about June 1 for the summer. This work will be resumed in three or possibly four months, depending on weather conditions. The pouring of concrete is suspended on the desert during the summer months, because of the excessive heat. The Metropolitan Water District engineers report that progress on most of the contracts is ahead of schedule.

The interesting illustration above shows **Barrett, Hilp & Macco Company's** Bucyrus-Erie electric dragline being towed across the desert to the jobsite on the aqueduct. Three tractors kept this 270,000-pound machine moving along at a steady pace.

Tunnel work continues at full speed. **Hamilton Gleason Company** has started concreting at Bernasconi Tunnel.

Dravo Company, with work approximately complete on Shafts No. 1, No. 2 and No. 3, is driving full speed ahead on the adit of the Valverde tunnel.

Shofner and Gordon have completed work on the Hayfield tunnel No. 2 and have abandoned camp, moving equipment elsewhere.

Hunkin and Conkey have completed 75 per cent of the Hayfield No. 1 tunnel, and anticipate leaving that site some time in July.

Work on the Pasadena tunnel, being driven by **L. E. Dixon, Bent Bros. and Johnson**, is going ahead rapidly, with excavation reaching the halfway mark at this date.

West Construction Company, driving the Monrovia tunnels, expect to start excavation at the Fish Canyon adit within a few days, as the access road has been completed to that tunnel. Seven bridges had to be built across the stream in order to complete the roadwork.

"Shall we give samples of cloth to ladies who are thinking of ordering swimming suits?"

"I guess so, but cut them small. We don't want 'em to use the samples to make the suit."

HAYWARD BUCKETS

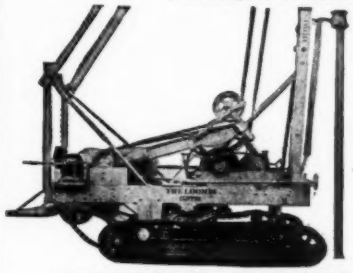
USE RIGHT BUCKET FOR THE JOB

Hayward makes all four — clam shell, drag-line, electric motor, orange peel. A Hayward recommendation is unprejudiced.

THE HAYWARD COMPANY
52-54 Church Street
New York, N. Y.

VERSATILITY!

The Improved Loomis "CLIPPER" Drill (for Steel Line) is easily adjusted to deliver long, crushing blows or short, cutting strokes to meet all rock conditions.



Increases drill hole. Decreases costs per day.

Ask us how.

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K Street Established 1842 Tiffin, Ohio

Specify DIETZ for Safety and Service!

DIETZ Lanterns assure highest lighting power over long burning periods — a RED light that STOPS reckless drivers — most Economical type of danger light for SAFETY and SERVICE.

Dietz Torches — for ALL-Weather service — unexcelled in lighting devices of their type.

Use Dietz Red Lanterns or Torches for fullest protection at lowest cost.

R. E. DIETZ COMPANY
NEW YORK
Makers of Lanterns for the World. Founded 1840

Our Engineering Department is at your service—Write us describing your job—your problems are our problems—let us figure with you, tell you what LeTourneau Equipment is doing for others.

LeTOURNEAU CARRYALLS

WELCOME ADVERSE CONDITIONS

Sticky mud, deep sand, adverse conditions . . . . these are the tests of good equipment. LeTourneau Equipment meets these tests, whips them, continues to deliver record yardages. Typical of LeTourneau earthmoving success are the two jobs pictured here.

(Above) A SMOOTH, HIGH SPEED FINISH—Moist red Illinois sand, hard to load, soft to travel over, but LeTourneau 12-Yard Carryalls delivered 100 cu. yds. an hour on a 1400-foot round trip haul . . . . 5000 yds. in 50 hours . . . . then finished the grade, thus eliminating the necessity of a blade.

(Left) HELPING BURLINGTON'S ZEPHYR BREEZE—Heavy soil, underlaid with wet, sticky clay, but the 12-Yard Carryall loads in a minute, makes 5½ 1800-foot round trips per hour, moving 38 cu. yds., to construct an underpass beneath the Burlington tracks. In this rain-soaked clay bed, loading was speeded with a "snap" tractor—no other equipment could even work.

R. G. LeTOURNEAU, Inc.
PEORIA, ILLINOIS STOCKTON, CALIFORNIA
Cable address: "BOBLETORNO"

Manufacturers of:
Angledozers—Bulldozers—Buggies—Carryall Scrapers—Rooters—Sheep's Foot Rollers—Power Control Units—Derricks

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Not in the Contract

In the course of the trial the judge turned to the Negro woman on the stand and asked: "Mandy, how old are you?"

"I'se 73, jedge."

"Are you sure?"

"Yas, suh!"

"Mandy, you don't look 73."

"I'se sure, jedge."

After a few moments the trial was interrupted by Mandy: "Jedge, suh, I was wrong when I said my age was 73; that's my bust measure."

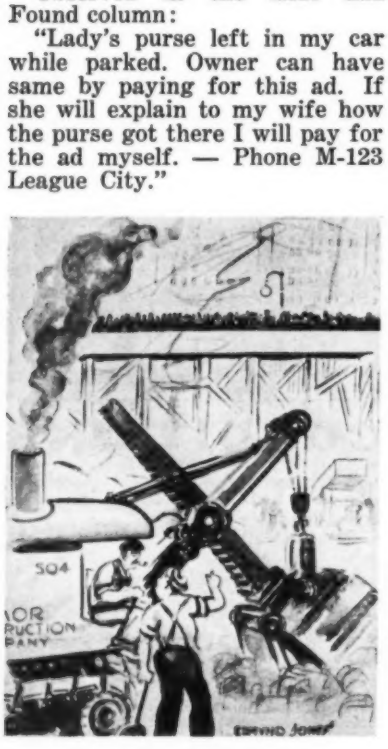
Newlywed: "I insured my life for ten thousand dollars today, dear, so if anything happens to me, you'll be well provided for."

His Bride: "Oh, how nice! Now you won't have to see the doctor about your cough."

Then there was the man who gave up drinking for the sake of his wife and kidneys.

Observed in the Lost and Found column:

"Lady's purse left in my car while parked. Owner can have same by paying for this ad. If she will explain to my wife how the purse got there I will pay for the ad myself. — Phone M-123 League City."



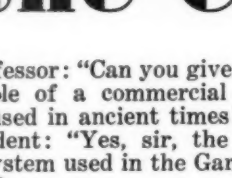
COURTESY OF THE FARM JOURNAL

"But I tell you it ain't in the plans to go no deeper."

"Yeah, I know, but what of it? We gotta consider our public."

Professor: "Can you give me an example of a commercial appliance used in ancient times?"

Student: "Yes, sir, the loose-leaf system used in the Garden of Eden."



The One: "Why are you divorcing your husband?"

The Other: "The other night he was reading the paper, and I slipped up and kissed him on his bald spot."

The One: "Yes?"

The Other: "And he said, 'Quit playing, honey, and get out those letters I dictated yesterday.' "

"If you saw a thousand-legged lady worm with her legs crossed, what popular piece would it call to mind?"

"No, a Thousand Times, No."

An old lady approached the postmaster and said: "I've been expecting a package of medicine for a week back and it hasn't come yet."

"For a weak back?" asked the postmaster. "What do you take for it? I have a weak back myself."

"I'm not interested in your back," replied the lady. "What I want is my package of medicine."

"Very well," said the postmaster, "Please fill out this form and state the nature of your complaint."

"Well," said the irate woman, "if you really must know, it's gas on my stomach."

Bing: "What do you mean kicking my dog? He doesn't even bite."

Bang: "Yes, but he raised his leg, and I though he was going to kick me."

Contractor (in drug store): "I want to buy a plow."

Clerk: "I'm sorry, sir, but we don't carry plows."

Contractor: "This is a hell of a drug store."

Sam: "Lissen heah, boy, jes' what kind o' life is you been livin'?"

Rastus: "Oh, ordinary, jes' ordinary."

Sam: "Well, if yo' pulls any mo' aces out o' yo' shoe, yo' ordinary life is goin' to mature."

Overhead while the boat was passing through a storm:

Sailor: "Ye ain't sick, are ye?"

Passenger: "Not exactly, but I'd hate to yawn."

The boys were enjoying a friendly game of cards. Suddenly one of the players threw down his hand. "This game ain't straight," he said angrily.

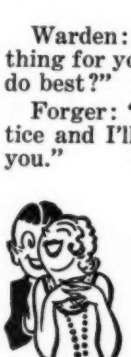
"Wotcher mean?" asked his opponent aggressively.

"What do I mean? I mean you're cheatin'. You ain't playing the cards I dealt you!"

Don't expect too much of any code. Think how long it is taking to put over the one that Moses presented.

Warden: "We must find something for you to do. What can you do best?"

Forger: "Give me a little practice and I'll sign your checks for you."



She: "Swell party tonight."

He: "Yea. I'd ask you for the next dance, but all the cars are taken."

Superintendent: "From your references I see you've had four places in the last month."

Would-be Shovel Runner: "Yes, sir, but that shows how much in demand I am."

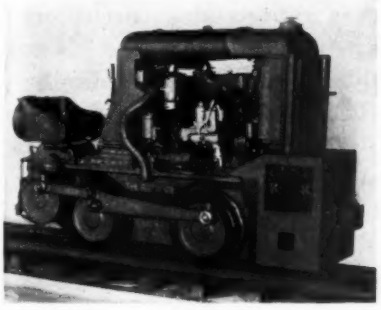
Boss: "When you called up my wife and told her I would be detained at the office and would not be home until very late, what did she say?"

Steno: "She said, 'Can I depend on that?' "

EQUIPMENT *You Ought to Know About*

(*Continued from Page 335*)

tive is used in mines where ventilation is not maintained naturally or induced in the drifts, equivalent to the requirement of 100 linear feet per minute, the Ruth Company equips the locomotive with a scrubber which removes all odor. The manufacturer states that Diesel-powered locomotives have been used underground during the past five years in Germany, France and Belgium. During the last two years, these



locomotives have been in use in England with the sanction of His Majesty's Mine Department for underground use. The United States Bureau of Mines has approved Diesel locomotives for underground use as per Information Circular 6732.

New Three-Wheel Elevating Grader

THIS hydraulic power operated unit provides increased capacity, regardless of the ground worked, by a novel combination of weight distribution, elevator design, plow beam control and steering, according to The Austin-Western Road Machinery Co., Aurora, Ill.

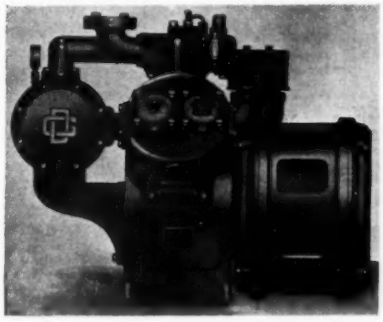
By supporting the welded, one-piece, steel frame on three wheels, the weight of the full loaded elevator is counterbalanced so that the 32-in. disc plow can be forced down and worked to maximum capacity. The elevator, driven at high speed by universal shaft, gets material away from plow as fast as it is dug. Elevator is equipped with anti-friction rolls and troughed belt. When elevator operates in average position, drive shaft is practically straight, thus reducing wear on universal joint.

Stiff leg plow is equipped with extra strong beam and standard. Beam is arched directly ahead of plow to eliminate "choking" when handling sod or large clods. Furrow wheel adjustment is hydraulically controlled.

All wheels are Timken Bearing equipped. Front wheel is carried in large, one-piece welded yoke and steered by adjustable pole through medium or large connecting links above frame deck. Hydraulic controls raise, lower or hold elevator and plow in any position.

Three-Cylinder Air Compressors

AVAILABLE in sizes ranging from 113 to 194 cubic feet per minute displacements, a new line of 3-cylinder air compressors, known as "WBR", is announced by the Gardner-Denver Company, Quincy, Illinois. One of the most distinctive features of the WBR compressor, Gardner-Denver officials state, is the use of two, small, low pressure cylinders, instead of one large one, resulting in lower air temperature with corresponding saving in horse power. Cylinder walls are water-cooled to provide lower wall temperature with better lubrication and longer life. In addition, the two-stage construction, with water-cooled cylinders and intercooler, assures sustained high efficiency. Other features include: a force feed pressure lubrication system; Timken heavy-duty, tapered roller type main bearings; and "cushioned" noiseless automotive plate type valves.



SAUERMAN LONG RANGE MACHINES

Reach Any Distance up to 1,500 ft.
Dig Deep; Dump High
Low Operating Cost
Handle from 100 to 5,000 cu. yds. a day.

Sauerman Slacklines and Drag Scrapers are money-savers for the many projects that require movement of materials beyond the reach of boom machines.

Write for 40-page Catalog.

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PERFORMANCE . . .
the Measure of Dependability

MORE than 90 per cent of all electric shovels manufactured by the two leading shovel manufacturers are operated by General Electric equipment. The significance to you of this figure is not in the percentage alone, but in the valuable experience gained both by General Electric and these manufacturers through co-operation—experience that, incorporated into these shovels, means satisfactory operation, year after year. General Electric, Schenectady, N. Y.

020-197

GENERAL ELECTRIC

For your convenience in writing to the advertisers on this page, you will find a card bound in this issue.

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★ ★ ★ **THE ITEMS LISTED on these pages have been selected because they offer unusual values to the man who is looking for a bargain. Some of this equipment is surplus stock which has never been used, some is rebuilt and carries new equipment guarantee, some is just plain used. But every item is priced for quick sale. If any of this equipment fits your needs send a postcard or letter, mentioning the reference number, to *Bargain Counter, Excavating Engineer, South Milwaukee, Wisconsin.* We'll pass your inquiry along to the owner and you will receive price and complete information promptly. Act now — with advancing prices on new stock this equipment will move fast.**

SHOVELS-CRANES DRAGLINES

P&H MODEL 208—45' BOOM DRAGLINE—4-cylinder 7¾"x9" Twin City gasoline engine and 1½ cu. yd. Omaha bucket. SCD-20.

MEAD-MORRISON GASOLINE COMBINATION SHOVEL-CLAMSHELL. ½ cu. yd. Dipper, 17' Dipper handle—18' Boom—32' Clamshell Boom and ½ yard Erie Clamshell Bucket. 5"x6" 4-cyl. Wisconsin Engine. Good mechanical condition. Bargain Price. SCD-28.

BAY CITY "PUP" GASOLINE CLAMSHELL. Good mechanical condition. SCD-24.

BYERS "BEARCAT" Gasoline ⅝-yard Shovel. Hercules engine. Overhaul. Good mechanical condition. SCD-25.

THEW-UNIVERSAL MODEL 35 — Gasoline — ½ cubic yard standard shovel equipment—25' lattice type crane boom and ½ yard Williams bucket with teeth—complete drag shovel attachment and skimmer scoop bucket, including home-made trailer. Excellent condition. SCD-26.

BUCYRUS-ERIE MODEL 30-B DIESEL SHOVEL—25'9" Boom, 14' Dipper Handle, 1 yd. Dipper. SCD-9.

COMPLETE FRONT END EQUIPMENT

Shovel Equipment

¾ CU. YD. DIPPER—20' boom—13' Dipper Handle—rope crowd shovel equipment. Suitable for models 1030 or 1035. NEW. SE-1.

¾ CU. YD. DIPPER—23' BOOM and ENGINE —12'6" DIPPER HANDLE—Shovel Equipment suitable for 20-B Gas or Diesel. NEW. SE-15.

¾ CU. YD. DIPPER—25'9" BOOM—14' DIPPER HANDLE—Shovel Equipment suitable for 30-B Diesel. NEW. SE-17.

⅞ CU. YD. DIPPER—21'9" BOOM and ENGINE—15' DIPPER HANDLE — High Lift Shovel Equipment. Suitable for 31-B Steam. NEW. SE-18.

1 CU. YD. DIPPER—20' BOOM—15' DIPPER HANDLE — Rope Crowd Shovel Equipment, suitable for Osgood "Conqueror." Good mechanical condition. Low Price. SE-24.

1 CU. YD. DIPPER—24' BOOM—18' DIPPER HANDLE—Slightly used but good conditioned. Suitable for any Bucyrus-Erie GA-2 or GA-3 Machine. SE-25

1¼ CU. YD. DIPPER—25' BOOM—17' DIPPER HANDLE—Slightly Used Rope Crowd High Lift Shovel Equipment suitable for Model 37-B. New Machine Guarantee. SE-5

1½ CU. YD. DIPPER—27' BOOM—17' DIPPER HANDLE—High Lift Rope Crowd Shovel Equipment suitable only for Bucyrus-Erie 43-B machines. Rebuilt—New Machine Guarantee. SE-23.

1 CU. YD. DIPPER, 26' boom, 15' dipper handle, rope crowd shovel equipment. Suitable for D-2 machine. NEW. SE-4.

½ CU. YD. DIPPER, 16' boom, 13'8" dipper handle. Shovel equipment suitable for type "A" shovel. NEW. SE-30.

⅝ CU. YD. DIPPER, 12'6" dipper handle, 16' boom. Shovel equipment suitable for type "A" shovel. NEW. SE-31.

Dragline Equipment

35' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2—20-B—31-B. NEW. DL-2.

40' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For use on Model D-2—20-B—31-B. NEW. DL-3.

45' CHANNEL BOOM, FAIRLEAD AND ROPES, but not including bucket. For Model E-2—41-B—42-B. NEW. DL-7.

BRAND NEW Ropes included with each of above Dragline Equipments.

All of above equipment is BRAND NEW and of BUCYRUS-ERIE manufacture.

Trench Digging Equipment

1 CU. YD. 42½" WIDE—Solid type Dipper—24' Boom and all auxiliary equipment. Will dig maximum depth 22'. For application to GA-2 or GA-3 Shovel. Rebuilt—New Machine Guarantee. DS-5.

BRAND NEW PAGE, two dippers each ¾ cu. yd., one 38" wide over cutters, the other 49½" wide over cutters. 17'1½" Boom and all necessary auxiliary equipment. Will fit Bucyrus-Erie 1030 or 1035. DS-7.

1-CU. YD 42½" WIDE SOLID TYPE DIPPER—24' Boom and all auxiliary equipment—will dig maximum depth of 22'—For application to GA-2 or GA-3 Clam Shell or Drag Line. Rebuilt—New Machine Guarantee. DS-8

BRAND NEW Ropes included with each of above Trench Digging Equipments.

Skimmer Scoop

⅝ CU. YD. DIPPER—20' Boom together with all necessary ropes and material to completely convert Bucyrus-Erie 1020 Shovel, Clamshell or Dragline to Skimmer Scoop Machine. NEW. Shipment 2 to 3 weeks. SS-1.

CLAMSHELL EQUIPMENT

50' BOOM CLAMSHELL EQUIPMENT including front drum and gearing but not including ropes. Practically new condition. Can be applied to Type B or B-2 machines. CS-1.

DIPPERS

Small Machines

2 ¾ CU. YD.—Plate.—Will fit 20-B Steam or Gas. NEW. D-12.

1 2/3 CU. YD.—Plate front.—Will fit 14-B. NEW. D-13.

2 ¾ CU. YD.—Rock Type.—Will fit 20-B Steam or Gas. NEW. D-15.

2 ¾ CU. YD.—Plate front.—Will fit 1030 or 1035. NEW. D-16.

2 ⅞ CU. YD.—Plate front.—Will fit 1030 or 1035. NEW. D-18.

1 ¾ CU. YD. CAST FRONT INSERTED TOOTH DIPPER. Will fit 1030 or 1035. Slightly used. D-36.

1 ⅞ CU. YD. CAST FRONT INSERTED TOOTH DIPPER. Will fit 1030 or 1035. NEW. D-37.

1 ⅞ CU. YD.—Plate front.—Will fit 18-B. NEW. D-20.

1 ⅞ CU. YD.—Rock type.—Will fit 31-B. NEW. D-21.

1 CUBIC YARD MANGANESE DIPPER. Will fit Bucyrus-Erie B-2 or GA-2. Good condition. D-40

1 1¼ CU. YD.—VAN PORT—ROCK TYPE. Will fit E-2, 41-B or 42-B. Slightly Used. D-26.

1 1¼ CU. YD.—VAN PORT—ROCK TYPE. Will fit E-2—41-B—42-B. NEW. D-27.

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1 1½ CU. YD.—PLATE.—Will fit E-2. NEW. D-28.

1 1½ CU. YD. CAST FRONT INSERTED TOOTH DIPPER. Will fit 43-B. Slightly used. D-39.

2 1½ CU. YD.—Manganese Front Inserted Tooth. Will fit E-2, 41-B or 42-B. Slightly used. D-29.

1 1½ CU. YD.—Vanderhoef type with Vanderhoef teeth. Will fit E-2 or 42-B. Slightly Used. D-30.

1—¾ CU. YD. ALL CAST ROCK 20-B TUNNEL. NEW. D-41.

1—1 CU. YD.—Plate Front—20-B. NEW. D-42.

1—1¼ CU. YD.—Cast Front—E-2, 41-B. USED. D-43.

2—1¼ CU. YD.—Manganese Front—Inserted Teeth—E-2, 41-B, 42-B. NEW. D-44.

Large Machines

1 2½ CU. YD.—Front 2½" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Can be used on 68-C and 70-C machines. NEW. D-1.

2 3 CU. YD.—Front 2½" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Can be used on Model 100-B, 68-C, 70-C Machines. NEW. D-2.

1 3½ CU. YD.—Front 2¾" Nickel Chrome Steel, two part Van Port Reversible Teeth. Can be used on Model 88-C, 95-C, Class 180. NEW. D-3.

1 4 CU. YD.—Front 2¾" Molybdenum Cast Steel, two part Van Port Reversible Teeth. Has seen some service but in good condition. Can be used on Model 100-C, 120-B. D-4.

3 6 CU. YD. Molybdenum Steel Front. Annealed Cast Steel Back, two part Reversible Van Port Teeth. Can be used on 225-B and 320-B. NEW. D-11.

1 8 CU. YD.—Front Molybdenum Steel, two part Van Port Reversible Teeth. Can be used on Model 320-B. Slightly used but excellent condition. D-6.

PUMPS

1 NB—3 STAGE CENTRIFUGAL PUMP—2" suction and discharge—bronze impeller and shaft—capacity 100 gallons per minute at 240' head operating at 1720 RPM or 270' head at 1780 RPM. Now equipped for belt drive but can be operated by 15 HP Electric Motor. ME-6.

DRAGLINE BUCKETS

NEW

1 ¾ CU. YD. PAGE CLASS "C". Approximate weight each 2425 lbs. DB-1

3 2 CU. YD. PAGE CLASS "C." Approximate weight each 5630 lbs. DB-4.

3 2½ CU. YD. BUCYRUS-ERIE TYPE "U". Approximate weight 3850 lbs. DB-13.

4 2½ CU. YD. BUCYRUS-ERIE TYPE "U". Approximate weight 4600 lbs. DB-14.

1—5 CUBIC YARD HEAVY DUTY—approximate weight 12000 pounds. Item DB-16

1—6 CUBIC YARD TYPE W MONIGHAN BUCKET—approximate weight 12500 pounds. Item DB-17

1—7 CUBIC YARD TYPE W MONIGHAN BUCKET—approximate weight 13700 pounds. Item DB-18

REBUILT

1 2 CU. YD. BUCYRUS-ERIE TYPE "U". Approximate weight 3200 lbs. DB-12.

1 2½ CU. YD. BUCYRUS-ERIE INSERTED TOOTH. Approximate weight 6500 lbs. DB-9.

1 2½ CU. YD. OMAHA STANDARD. Approximate weight 5400 lbs. DB-10.

USED

1 1 CU. YD. PAGE BUCKET. DB-20.

1—6 CUBIC YARD TYPE W MONIGHAN—approximate weight 12500 pounds. DB-19.

ELECTRICAL EQUIPMENT

90 H.P. MOTOR—GENERAL ELECTRIC—3 phase, 25 cycle, 550 volt, 1500 RPM. NEW EE-1.

50 KW MOTOR GENERATOR SET—GENERAL ELECTRIC—consisting of 75 H.P. induction motor, 3 phase, 60 cycle, 440 volt, connected to 50 KW, 250 volt—1200 RPM Generator, includes suitable rheostat and compensator. NEW. EE-2.

75 H.P. COMPENSATOR—GENERAL ELECTRIC—2200 volt, 3 phase, 25 cycle, manual type. NEW. EE-3.

5 KVA TRANSFORMER—GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

125 KW GENERATOR—WESTINGHOUSE—250 volts, 500 amperes, Direct current. 440 RPM. Includes two outboard bearings. NEW. EE-5.

MAGNETS

1 45" CUTLER-HAMMER MAGNET, Model 542H-14A. Good condition. Requires 10 KW generator to operate. M-1.

LOCOMOTIVES

3 24-INCH GAUGE 3-TON BALDWIN GASOLINE LOCOMOTIVES, Model AL, Type 2. Price very favorable. L-1.

TRAILERS

1-14 TON WILLIAMS "ECONOMY" TRAILER. Arch Girder Construction—Safety Chains—Rear Loading ramp. Solid Rubber tired wheels 28"x10" front 28"x16" rear. Deck dimensions 12'x7'9"x31½" high. NEW. T-1.

ROAD ROLLERS

1 10-TON BUFFALO SPRINGFIELD GASOLINE ROLLER with scarifier. About three years old. Splendid condition. Very favorable price. RR-1.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2—150 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—5 cylinder, 9" bore x 10½" stroke, 450 R.P.M., 4 cycle, vertical overhead valves, dust proof, oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

1—45 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINE—4 cylinder, 6" bore x 8" stroke, 650 R.P.M., 4 cycle, vertical, overhead valves and forced lubrication. DE-5.

3—110 H.P., NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—6 cylinder, 7" bore x 8½" stroke, 600 R.P.M., 4 cycle, vertical, overhead valves and forced lubrication. DE-6.

Gasoline

1 MODEL HH-U NOVO—16 H.P. ENGINE—4-cylinder, 3⅜"x4"—1200 R.P.M.—Radiator cooled—complete power plant—mounted on channels—sheet metal housing—extended crank shaft 1⅞" diameter, including outboard bearing with Fafner ball bearing. GE-1.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4⅝"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

BOILERS

NEW

Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

Vertical Type

3 46½"x110"—40 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

1 54"x100"—64 H.P.—125 lb. Working Pressure. ASME Std. Will fit B-2 or B-3. B-11.

2 42"x88"—35 H.P. 144 lb. working pressure. Mass. Std. Will fit type B. B-17.

Locomotive Type

3 44"x17'—75 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-13.

1 44"x18'—88 H.P.—125 lb. Working Pressure. ASME Std. Will fit Model 70-C. B-14.

2 54"x11'3"—84 H.P.—125 lb. Working Pressure. ASME and Mass. Std. Will fit Model 50-B Machine. B-16.

2—70"x12'—136 H.P. 175 lb. working pressure. ASME, and Mass. Std. Will fit 120-B. B-18.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft. piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure. A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M.—Overall dimensions: Height 45"—length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

Modern Canal Planned for New Jersey

(Continued from Page 330)

gether with resultant losses of clays, fine sands and friable earths.

The daily speed of drilling varied over a wide range and depended to a great extent on the physical character of the ground encountered. In hard, compact Cretaceous sands, footage advanced only 5 to 15 feet per 8-hour drill shift, as against advances of 30 to 40 feet per corresponding unit of time spent in drilling loose Pleistocene sands and gravels. But, by comparing the results of one contract with another, the average hourly progress in similar formations became fairly constant, as is shown in the accompanying table. In other words, the average drill speed made per working hour during contracts number 2 and 3, which respectively included work in loose ground, practically equaled the rate per working hour attained by drilling 224 holes (contract number 1) in both compact and loose ground throughout the entire route and along various alternate routes.

Contract	Holes Drilled	Depth of Holes Ave.	Max.	Min.	Feet Drilled per Working Hr. Earth and Clay	Rock	Earth and Clay	Rock	Time in Hours Total	Drilling	Delays	Delays in Per Cent
No. 1	224	103	189	55	22,964	0	3.2	0	10,754	7,251	3,503	32.6
No. 2	26	154	189	122	3,998	0	2.8	0	1,715	1,426	289	16.8
No. 3	60	58	160	21	3,342	112	3.9	0.5	3,168	897	2,271	71.7
Total	310	98	189	21	30,304	112	3.2	0.5	15,637	9,574	6,063	38.8

A combination of shallow drill holes and relatively long distances between drill-hole locations added, somewhat, to the usual delays. For example, on contract number 1, crews were often obliged to shift their rigs 1,000 to 3,000 feet through wooded swamp lands, drill a series of shallow holes, and move a distance of several miles to new locations, while, on the other hand, the equipment used for contract number 2 drilled deeper holes and moved shorter distances through open and well developed country. The unusual delay of 71.7 per cent is principally due to the fact that the contractor in charge lost a number of working days in securing additional equipment to drill trap rock and shale, although other factors such as locations in river beds and marsh lands accounted for a reasonable amount of lost time.

Philip J. Healy, Inc., New York City, did the work of contract No. 1 at a price of $1.25 per foot. The George Drilling Co., New York City, completed contracts Nos. 2 and 3, at the respective prices of $0.90 and $0.84 per foot, sub-letting a portion of contract No. 3 to Battle Brothers of Scranton, Pennsylvania, at the basic price of 84 cents per foot.

Canal to Be 250 Feet Wide

Completed plans* provide for a canal at an elevation of ten feet above mean low water, a minimum depth of 25 feet, a bottom width of 250 feet, and side slopes of 2½ horizontal to 1 vertical. To maintain the canal level, suitable dams with adequate flood gates are proposed — one dam across the Delaware River a short distance below Bordentown, and another at Sayreville across the Raritan River. Four parallel locks for the passage of navigation are proposed at each dam, two to be 880 feet long and 90 feet wide with intermediate gates, and two to be 370 feet long and 50 feet wide. The plans include channels 300 feet wide and 29 feet deep, extending from the 30-foot channel already provided in Raritan Bay to the locks at Sayreville on the Raritan River and from the locks at Bordentown down the Delaware River to the 35-foot channel at Philadelphia, a distance of about 26 miles.

The plans also provide for the construction of 15 highway bridges and 3 railroad bridges over the canal, with necessary approaches and relocations. All bridges are to afford a horizontal clearance of 300 feet. Fixed bridges are to afford a vertical clearance of 135 feet and drawbridges a clearance of 72 feet, with the draw closed, so that the opening of the draw will be required only for large vessels.

Since the Delaware River below Trenton is the source of municipal and industrial water supply for the City of Philadelphia, other municipalities and for a large industrial region, the intrusion of salt water into the Delaware through the canal cannot be tolerated. Also during drought periods, salt water of the lower Delaware estuary works upstream to an extent to cause grave concern to the dependent municipalities and industries, and it is therefore essential that the design of the canal be such as to require no large diversion of the water from the Delaware, particularly during protracted dry periods. These considerations dictate a lock canal, but one at so low a level as to reduce the required water supply for lockage to a minimum. The plans provide for these requirements and at a cost substantially the same as for a sea-level canal with a guard lock.

Will Greatly Aid Navigation

The main function of the project is to provide a short, adequate water route between New York and Philadelphia to connect with existing waterways, thereby forming a protected inland route for coastwise shipping, ocean tramp steamers, barges and other light craft between the principal North Atlantic ports from Norfolk, Virginia, to Boston. As compared with the present line of water travel, that is, via the Atlantic Ocean, around Cape May and up Delaware Bay, such a water route would reduce the sailing distance, from the Battery in New York Harbor to the wharves at Philadelphia, from 274 to 87 miles, a saving of 187 miles, or 68 per cent. When expressed in terms of time, this reduction in distance represents a saving of approximately 11 hours per one way trip for the faster ships and a proportionately greater saving for the slower vessels.

*Editor's Note: From the Official Canal Report: House Document No. 219; 73rd Congress, 2nd Session.

Field Notes

(Continued from page 334)

finished product. The green gold color of the coal serves to distinguish that coal as coming from the Pittsburg & Midway Coal Mining Company and becomes associated in the mind of the buying public as identifying it as being a quality product.

Extent of Duty to Safeguard Excavations

WHERE an excavating contractor knows that safeguards placed at excavations to avoid injury to persons, etc., have been disturbed by outsiders, he must use increased caution to make the safeguards more effective, according to a decision rendered by the Tennessee Supreme Court (8 S. W. 2d, 495).

A light and power company excavated a hole about 18 inches wide and five feet deep between a sidewalk and street curbing. Loose boards were placed over the hole, with dirt on top to weight them down. They were replaced by the company after having been removed by an outsider. The next morning the boards were found displaced again. A plank covering was then provided, with a rock to hold it in place. Again the covering was removed and a pedestrian stepped into the hole. Her suit for damages was dismissed by the trial court, on the ground that the company had done all that was required of it to guard against injury of any one. But the Supreme Court reinstated the suit and ordered a new trial, saying:

"Having created a situation of potential danger to those lawfully using the grass plot by causing the hole to be dug, defendant was under the continuing duty to exercise ordinary care to prevent injury therefrom to all persons rightfully using the public street at that point; and defendant cannot relieve itself from the obligations which the law imposed, nor can it escape liability for the natural consequences flowing from its own breach of duty, by merely showing that it had the lawful right to dig the hole in question, that it had in the first instance and even subsequently placed a covering over the hole, that the last covering so placed had been removed by some unknown means, and that it had no notice of such removal of the covering in time to have enabled it to provide necessary protection against the danger which the uncovered hole then caused to exist. . . .

"While defendant was only obligated to exercise ordinary care to prevent injury resulting from the hole it had dug, it is manifest, we think, that with knowledge of the uncovering of the hole by a third person on the day preceding the accident, and also that at about 7 a. m. of the following day (the day of the accident) the covering was again off, defendant did not exercise, under these circumstances, ordinary care by again covering the hole in the insecure manner shown."

While the opinion does not indicate just what precautions the defendant should have taken, it is not to be inferred that defendant was bound to post an armed guard to prevent removal of the covering. But it is to be inferred that whenever an excavator is apprised of the probability that safeguards will be removed, he must use such precautions as the situation reasonably call for.

—Arthur L. H. Street, Attorney at Law.

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EXPERT DRAGLINE AND SHOVEL OPERATOR

16 years' experience as shovel operator. Married, 36 years of age. Have operated practically all makes of machines, and have 10 years' experience as dragline operator. Can handle steam, Diesel, electric or gasoline machine. Have worked on highway and railroad grading, rock excavation in quarry, drainage and irrigation and dredging and also gold dredging. Prefer position on Bucyrus-Erie E-2, D-2, or 50-B or other Bucyrus-Erie machines. Have also operated Class 220 and 225 electric and Diesel electric machines. Capable of taking charge of repairing and erecting and can handle crews. Best of references and can do own repairing. At present located in California, but will go anywhere. Box 5507.

DRAGLINE-SHOVEL-CLAMSHELL OPERATOR

18 years' experience on general excavating construction and coal mining desires position as shovel or dragline operator. Capable of operating all types and sizes of machines. Best acquainted with Bucyrus 50-B, 30-B, D-2, 225-B steam; Northwest draglines; P&H 206, 600, 400; Lima 101, 404, 601; and Monighan 2-T, 3-T. Can do own repair work and can take charge of equipment if desired. Was superintendent four years for one company. Can furnish good references. Age 34, married. Have operated floating dredges but prefer shovel or dragline work. Available immediately. Will go anywhere for right price and reliable company. Present location, Indiana. Box 7403.

BOOKKEEPER

Young man, 26, married, high school education, 5 years' experience with limestone company, now employed, desires position with limestone company and chance for advancement. Will go anywhere. Box 7401.

OPERATOR

15 years' experience on gasoline, steam and electric machines. Bucyrus-Erie, Thew and Northwest machines. Prefer operating Bucyrus-Erie. Have worked on highway and railroad grading, quarry, excavation. Willing to go anywhere in U. S. A. Can do all repairing and furnish excellent references. Box 7001.

EXPERIENCED DRAGLINE-CLAMSHELL-SHOVEL OPERATOR

Experienced operator desires work anywhere. Has had 15 years' on dragline work, 4 years' operating clamshell machine and 2 years' on a shovel. Experienced on railroad grading, sand and gravel, and general excavating construction work, principally operating steam machine, but has had three years' operating electric, 2 years' on gasoline and 1 year on Gas+Air machine. Prefers large Bucyrus-Erie any type; steam or electric power. Can furnish best of references from former employers. Age 40. At present located in Western New York. Box 7301.

STUDENT DESIRES PRACTICAL EXPERIENCE

Civil engineering student desires work during summer (or longer) as surveyor, timekeeper, clerk, typist, or any position where practical experience can be obtained on construction or mining projects. Will go anywhere for enough work to justify transportation expenditure. Two years' experience in all branches of surveying at college. Can furnish good references. Box 7404.

OPERATOR—PIT FOREMAN—DRILL FOREMAN

14 years' experience as shovel operator and pit foreman on coal stripping, railroad grading, highway grading, quarry and gravel pit work. Drill foreman on blast hole, tripper rod and air drills. Can operate oxy-acetylene cutting and welding torch. Can do own repair work. Age 41. Can furnish good references. Willing to go anywhere in U. S. A. Now located in Tennessee. Box 7101.

OPERATOR

15 years' experience on Erie, Keystone and Osgood gas machines. Can do own repair work. Willing to go anywhere in U. S. A. Box 7200.

SHOVEL OPERATOR

34 years' experience on Bucyrus, Osgood, Thew, Erie, Marion, Bay City steam or gas machines in rock quarry, coal stripping, R. R. ditching and grading. Can do own repairing and furnish excellent references. Married. Present location, West Virginia. Box 7402.

For your convenience in writing to The Koenig Labor Agencies, you will find a card bound in this issue.

Trade Notes

Bucyrus-Erie Company, South Milwaukee, Wisconsin, announces the appointment of **R. S. Armstrong & Bro. Company**, 676 Marietta Street, N. W., Atlanta, Georgia, as distributor for the sale of power shovels, draglines, cranes, clamshells, dragshovels and skimmer scoops from ⅜ to 2-yard capacity in the State of Georgia. R. S. Armstrong & Bro. Company will carry a stock of repair parts for current machines.

Bucyrus-Erie Company, South Milwaukee, Wisconsin, announces the appointment of **Joseph Kesl Tractor & Equipment Company**, 1510 North 13th Street, St. Louis, Missouri, as its distributor in the eastern portion of Missouri and the southern part of Illinois. The Joseph Kesl Tractor & Equipment Company will handle Bucyrus-Erie machines ranging from ⅜ to 2-yard capacity — shovels, draglines, cranes, clamshells, dragshovels and skimmer scoops. For quick service, phone Central 8025.

Book Reviews

Aerial Tramways—A 100-page book on aerial wire rope tramways of all descriptions has just recently been issued by the **American Steel & Wire Company**. The book, profusely illustrated, explains in detail the many applications and uses of aerial tramways. It should prove of great value to mining and construction men who have or may have need for a tramway in their work. A copy of this book may be had by writing to the American Steel & Wire Company at 208 S. LaSalle Street, Chicago, Illinois, or any of their district sales offices.

Construction Costs—The 1935 edition of Construction Costs recently published by **Engineering News-Record** contains many new features of interest to the construction field. Among them are: Cost trend based on four university buildings, 1928-1934; Cost analysis on industrial buildings, reinforced concrete, mill construction, steel and brick; average wage rates on PWA highway construction; and analysis of labor-material-overhead components in contractor's dollar. The book contains 96 pages and may be obtained from Engineering News-Record, 330 W. 42nd St., New York City. Price $1.00.

Aqueducts—A 64-page booklet entitled "On the Aqueducts of the Pacific" has recently been published by the **Atlas Powder Company** of Wilmington, Delaware. The book, handsomely illustrated, contains many interesting facts regarding aqueduct construction on the West Coast, particularly in regard to the Colorado River Aqueduct now under construction by the Metropolitan Water District of Southern California. Other aqueducts mentioned include Hetch Hetchy, Owens Valley Aqueduct, Seattle and Portland Aqueducts, and East Bay Project. A copy may be had by writing the Atlas Powder Company.

Care of Gas-Welding Equipment—A new and completely revised edition of "Precautions and Safe Practices" has been recently published by **The Linde Air Products Company**, 30 East 42nd Street, New York City. While the subject of safety is well standardized, and therefore subject to but little change, the advances in the oxy-acetylene process itself, and its widening use during recent years, have shown where additional emphasis in safety precautions is needed, and have necessitated some new suggestions. Everyone responsible in any way for the storage, care of handling of oxy-acetylene welding and cutting equipment should have a copy of this booklet for careful study and constant reference. All those having copies of the previous edition should provide themselves with the revised edition to become familiar with the new recommendations. A copy may be had free by writing the manufacturer.

Welders—A new bulletin, recently issued by **General Electric** of Schenectady, N. Y., describes in detail features of the type WD arc welders. A complete description of the machine is given. Another bulletin entitled "Welding Electrodes and Accessories" describes the full line of General Electric welding electrodes with suggestions as to their proper application in the field. Copies of these bulletins may be had by writing the nearest General Electric office.

Tractors—The Diesel Forty Tractor is featured in a 44-page catalog recently by **Caterpillar Tractor Company** of Peoria, Illinois. The new booklet is printed in two colors and makes liberal use of model and action pictures to illustrate the text. Copies may be obtained from Caterpillar distributors or the manufacturers.

Drill Equipment—A 12-page bulletin, No. W-1200-B10, recently published by **Worthington Pump and Machinery Corporation**, Harrison, New Jersey, describes in detail shop equipment for dressing drills. Included in the bulletin is the automatic drill-steel heat-treating furnace, both oil fired, and electrically heated. Forging furnaces are also listed. Suggestions as to shop layouts for efficient handling of drill-steel are made. A copy may be had by writing the manufacturer.

FOR SALE

RATES:	First insertion rate per column inch	Repeat insertions (no change in copy) rate per column inch
Up to 3 inches	$4.50	$4.00
Over 3 and up to 7 inches	4.25	3.75
Over 7 inches	4.00	3.50

Rates are net (no commissions, no discounts) and payable in advance of publication. Send your remittance with insertion order and copy.

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

Small Shovels
Under 2 Yards

LIMA MODEL 101—Combination 1¼ yard shovel and 40' plus 10' extension Dragline—powered with gasoline engine Model JK 6½" x7"—4 cylinder. Shovel equipment practically new. Located Colorado. Box 599-SS.

THEW-LORAIN 75-B 1¼ CU. YD. gasoline shovel. A-1 condition. Located Texas. Box No. 565-SS.

THEW-LORAIN 75-A combination 1¼ yard Shovel and 50' Boom Dragline including one yard Drag Bucket. Good condition. Located eastern Pennsylvania. Box 610-SS.

MARION TYPE 32 STEAMER, Shop No. 5676, 18' boom, 15' dipper handle, 1¼-cu. yd. dipper shipped May, 1926, good operating condition. Box 451-SS.

BUCYRUS-ERIE 35-B ELECTRIC 24' BOOM, 16' Dipper Handle, 1½ cu. yd. Dipper, 3 phase, 25 cycle, 440 volt, Cat mounted. Box 544-SS.

BUCYRUS-ERIE 43-B GASOLINE CHAIN CROWD SHOVEL — 23' boom — 17' dipper handle—1½ cubic yard Vanderhoef dipper and teeth—electric starter—standard single shaft cat. Operated less than six months. Excellent appearance and condition. Will be demonstrated by owner. Located vicinty New York. No. 512-SS.

LORAIN—75-A—One cubic yard Gasoline Shovel. Good condition. Located Chicago. Box 676-SS.

LORAIN—MODEL 60—One cubic yard Gasoline Shovel. Good condition. Located Chicago. Box 677-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Good working condition. Located northern New Jersey. Price very reasonable. Box 643-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Very good working condition. Located South Carolina. Box 644-SS.

GA-2 SHOVEL, BUCYRUS-ERIE NO. 9918, 22' Boom, 16' Dipper handle, 1 cu. yd. manganese steel front inserted tooth dipper, 20-10 Gas Air single shaft drive, caterpillar mounted, 6¼x8", 4 cyl. Waukesha Motor. Weight 71,900 lbs. Reconditioned. Located Greensboro, N. C. Price $5000.00. Box 595-SS.

BUCYRUS ERIE GA-2 Gas-Air High Lift Shovel—24' Boom, 16' Dipper Handle, 1¼ cu. yd. Dipper, Single Shaft Cat, Electric Starter. Waukesha 4-cylinder 6¼"x8" Gasoline Engine. Reported excellent condition. Located West Virginia. 593-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

THEW LORAIN MODEL 75 SHOVEL. 24' Boom, 18' dipper handle, 1¼ cubic yard dipper. Gasoline. Machine now operating. Located central New York State. Box 665-SS.

UNIVERSAL ⅜ CUBIC YARD SHOVEL. 14' Boom, 10' Dipper Handle. Impulse starter. Caterpillar mounted. Very good condition. Located central New York. Box 666-SS.

BUCYRUS-ERIE LATE MODEL B-2 STEAM HIGH LIFT SHOVEL. 1 yard dipper—single shaft cat mounting. Good condition. Located near St. Louis. Box 518-SS.

MARION MODEL 450—1¼ Cu. Yd. Steam Shovel, Cat Mounted. New Gears on Caterpillar recently installed. Price favorable. 536-SS.

NORTHWEST MODEL 105 SHOVEL. Bargain Price. Located Texas. Box No. 566-SS.

NORTHWEST NO. 4—24' Boom, 16' Dipper Handle, 1 yard Dipper—Gasoline—Located eastern New York. Good condition. Box 600-SS.

BUCYRUS-ERIE GA-2—Gas-Air Combination High Lift Shovel and 50' Boom Dragline Equipment, mounted on Single Shaft Cat. Good operating condition. Located at Shawnee, Okla. 537-SS.

BUCYRUS-ERIE MODEL 1035—Gasoline, Chain Crowd Shovel, Single Shaft Cat, 26" Treads, Electric Starter, ⅞ Cu. Yd. Dipper. Now operating. Can be demonstrated. Located Massachusetts. 535-SS.

BUCYRUS-ERIE TYPE B STEAM COMBINATION SHOVEL-CLAMSHELL AND STEAM HOE. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SS.

GENERAL ½ cubic yard Gasoline Shovel—including 30' Boom Clamshell and Dragline Equipment—New 1931—powered with Buda DW6 High Altitude Gasoline Engine. Excellent condition. Located near Denver. Box 588-SS.

BYERS MASTER SHOVEL — 26' Boom, 17' Dipper Handle, 1¼ cu. yd. Dipper, New January 1931. Good working condition. Located Melvern, Kansas — Highway 75 south of Topeka. Price very favorable. 591-SS.

BUCYRUS-ERIE GA-2 Gas-Air Extra High Lift Shovel—24' Boom, 18'4" Dipper Handle, 1¼ cu. yd. Dipper, Single Shaft Cat. Electric Starter. Excellent condition. Located eastern Pennsylvania. 592-SS.

BUCYRUS-ERIE—42-B Steam Shovel. Caterpillar Mounted, 21' Boom, 15' Dipper Handle, 1½ Cubic Yard Dipper, Power Boom Hoist. This machine excellent mechanical condition. Located Birmingham, Alabama. Can be demonstrated. Box 531-SS.

2 BUCYRUS-ERIE—GA-2—Combination—45' Boom Clamshell—Crane machine and Extra High Lift Shovel equipment. Cat mounted—Self starter—All field rebuilt last year—Excellent condition—Located Eastern Pa. Box 485-SS.

BUCYRUS-ERIE 42-B STEAM SHOVEL—late model, 21' boom, 15' dipper handle, 1½ cu. yd. Vanderhoef dipper, boom hoist, dipper trip. Massachusetts standard boiler, cat mounting. Good operating condition. Now located and can be demonstrated at Colchester, Conn. Box No. 533-SS.

BUCYRUS-ERIE GA-2 Gas-Air High Lift Shovel. 24' Boom, 18'4" Dipper Handle, 1 cubic yard Dipper. Single shaft cat. Waukesha four cylinder gasoline engine. Excellent operating condition. Located North of Chicago. Box 645-SS.

BUCYRUS-ERIE GAS+AIR—22' Boom, 16' Dipper Handle, 1¼ cubic yard Dipper, Waukesha 6¼"x8" four cylinder gasoline engine. Single Shaft Cat mounted. First class condition. Located eastern New York. Box 601-SS.

TYPE "B" CAT. MOUNTED, equipped with 19'6" boom, 16' dipper stick and ¾ yard dipper, in good working order. Located near Hudson, Pennsylvania. Price $1750.00. Box 493-SS.

BUCYRUS-ERIE GAS-AIR, 22'6" boom, 16' dipper handle, 1 cubic yard inserted tooth dipper. Single shaft cat. Waukesha 4-cylinder 6¼"x8" gasoline engine. Electric starter. Battery lighting plant. Splendid mechanical condition. Located Tennessee. Box 671-SS.

BUCYRUS-ERIE Steam Combination Shovel and Clamshell Machine. Single shaft cat mounted. ¾ cubic yard Williams Clamshell Bucket included. Excellent mechanical condition. Located Virginia. Box 672-SS.

BUCYRUS-ERIE GAS-AIR TYPE GA-2 HIGH LIFT SHOVEL — 22'6" boom — 16' dipper handle—1¼ yard cast front inserted tooth dipper—single shaft caterpillar mounting—electric starter. Excellent condition. Field reconditioned. Waukesha 4-cylinder 6¼"x8" engine — New cylinder blocks and piston rings. Located near Scranton, Pennsylvania. Will demonstrate. Box 508-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL: 21' boom, 15' dipper handle, boom hoist, dipper trip, 1¼ cu. yd. Vanderhoef dipper, cat mounting, now located and can be demonstrated at Colchester, Conn. Very favorable price. Box No. 532-SS.

BYERS BEAR CAT—⅝ yd. Gasoline Shovel—Recently overhauled — Located Birmingham, Alabama. Box 480-SS.

P & H MODEL 600—1 yd. Gasoline Shovel—including 40' boom dragline equipment without bucket. Waukesha Engine. Recently overhauled. Located in Alabama. Box 483-SS.

NORTHWEST MODEL 6—1½ CU. YD. SHOVEL—22' Boom, 19' Dipper Handle, Caterpillar Diesel Model D-11000 6-cyl. Engine. Rebuilt early this year. Excellent condition. Located eastern Pennsylvania. Box 547-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL—21' Boom, 15' Dipper Handle, 1¼ cu. yd. Dipper, Power Boom Hoist, Cat mounted. Located New York City. Box 545-SS.

TWO (2) MODEL 301 STANDARD KOEHRING MACHINES, good operating condition. Now operating and can be inspected in southwestern Ohio. Price, $3,000.00 each. Box 540-SS.

LIMA MODEL 101—1¼ yard Shovel, Waukesha type WL Gasoline Engine. Very favorable price. Located Kansas City, Missouri. Box 598-SS.

LINK-BELT COMBINATION SHOVEL — CLAMSHELL — DRAGLINE — 1½ cubic yard capacity. 22' shovel boom, 16'6" dipper handle, 1½ cubic yard Esco dipper. 45' clamshell-dragline boom and 1 cubic yard Blaw Knox No. 618 clamshell bucket and 1½ cubic yard Esco drag bucket. Powered with Atlas four cylinder 7"x10½" 100 H.P. Diesel Engine. Very good operating condition. Recently overhauled. Working weight as shovel approximately 85000 pounds. Complete shipping weight 100,000 pounds. Priced right. Box 650-SS.

1 BUCYRUS-ERIE B-2 Steam ⅞ yard High Lift Shovel—Cat Mounted. Good operating condition. Located near Boston. Make offer. Box 521-SS.

BAY CITY GASOLINE TRACTOR SHOVEL— ⅜ cubic yard capacity—including Pull Shovel Attachment. Powered with McCormick-Deering Unit. Located southern Alabama. Box 662-SS.

P&H MODEL 300 SHOVEL—18' Boom, 15' Dipper Handle, ⅝ cubic yard Dipper, manganese front. Powered with Waukesha B U 4½"x6¼" engine, power clutch control. First class operating condition. Located Massachusetts. Box 663-SS.

P&H MODEL 600—1¼ CUBIC YARD GASOLINE SHOVEL. Will be put in good operating condition. Located eastern Pennsylvania. Box 664-SS.

FOR SALE CHEAP

Marion Model 440 Gas Shovel and Dragline, 1 cubic yard capacity. For sale cheap. Located Missouri. Box 634-SS

Make an Offer

MARION SHOVELS

—Model 450 Electric Shovel, 1¼ cubic yard dipper and 2 yard plate-dipper.

—Model 450 Electric Combination Shovel and Dragline. ¾ yard dipper, 1 yard dipper, and 1¼ yard dipper, also 2 cubic yard light, plate-front dipper. Boom adjustable 40', 45' and 50'.

—No. 7 Gas-Electric, Combination Shovel and Crane. ¾ yard shovel dipper, 45' crane boom.

—No. 7 Gas-Electric, Standard ⅞ cubic yard shovel. Good condition.

—Model 480 Electric, Combination shovel and dragline. 70' boom and Type X Bucket,—2 cubic yard capacity. Shovel dipper 2 cubic yard. Good condition.

—Model 480 Electric Dragline. 70' boom, 2 yard X Bucket. Good condition.

—Model 490 Electric Shovel. 2¼ cubic yard dipper. Good condition.

Box 633-SS

GA-2 HIGH LIFT SHOVEL—24' boom, 16' dipper handle, 1¼ cubic yard dipper, on single shaft cat. Electric starter, Waukesha 4-cylinder 6¼"x8" gasoline engine. Reported excellent condition. Located Virginia. Box 623-SS

BUCYRUS-ERIE GAS SHOVEL—20'6" boom, 13' handle, ⅞ cubic yard, late model, Shop No. 10350. Good operating condition. Located eastern Minnesota. Available for demonstration. Priced right for quick sale. Box 670-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

2 INSLEY ⅜ YARD GASOLINE SHOVELS. Located eastern New York State. Bargain prices. Box 574-SS.

OSGOOD MODEL 18 Steam—¾ yard shovel—Cat mounted. Just completely overhauled. Excellent condition. Located near Indianapolis, Ind. Box 522-SS.

MARION 1 YARD STEAM SHOVEL
Box 575-SS.

TWO 1030 single motor ELECTRIC SHOVELS. 12'10" boom, 10'6" dipper handle, 1 yard rock dipper: also 40' boom crane equipment, 7'6" rear end clearance. Electric power supply 3 phase, 60 cycle, 440 volt. Located Philadelphia. Very good condition. Box 626-SS

42-B STEAM SHOVEL—cat mounted. 21' boom, 15' dipper handle, two dippers—one 1½ cubic yard Vanderhoef dipper. Power boom hoist. Good condition. Located Rhode Island. Box 627-SS

⅜ YARD SHOVEL

Universal ⅜ yard gasoline shovel—¾ swing. Good operating condition. Located Northern Michigan. Box 636-SS

B-2 STEAM SHOVEL, CAT MOUNTED. 19'9" boom, 16' dipper handle, 1 cubic yard dipper. Good running condition. Located, Minnesota. Box 621-SS

TYPE B STEAM SHOVEL, Cat mounted, 19'6" boom, 14' dipper handle, ¾ cubic yard dipper, also 36' clamshell boom and front drum and gearing. Located Kansas City, Missouri. Box 622-SS

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

Small Shovels
Under 2 Yards
Continued

BUCYRUS-ERIE 41-B STEAM SHOVEL—21′ boom, 15′ dipper handle, 1¼ cubic yard Vanderhoef front quarry dipper, power boom hoist. Cat mounted. Good condition. Located near Boston. Price very reasonable. Box 604-SS.

BUCYRUS-ERIE GA-2 Gas-Air—Extra high lift 24′ boom—15′ 4″ dipper handle, 1 cu. yd. dipper. Single shaft cat mounting—air starter. Good condition. Located near Hartford, Conn. Box 523-SS.

1—Type B Bucyrus-Erie Combination High Lift Shovel and 40′ Clamshell Machine.
1—Type B Bucyrus-Erie High Lift Shovel.
2—Type B-2 Bucyrus-Erie High Lift Shovels.
All located western Connecticut. Operating condition. Entire lot very low price. Box 573-SS.

BUCYRUS-ERIE GAS SHOVEL—⅝ YARD—Shop No. 11000—35′ clamshell boom, including ⅝ yard Williams clamshell bucket. Located near Oshkosh, Wisconsin. Good condition. Priced to sell. Box 659-SS.

KOEHRING MODEL 601 SHOVEL. Cat mounted. 24′ boom, 18′ dipper handle, 1½ cubic yard manganese front dipper. 20″ Cat treads. Wisconsin 6-cylinder Model E, 6″x7″ gasoline engine. Located Maryland. Box 631-SS

TWO KOEHRING MODEL 502 COMBINATION SHOVELS AND CRANES. Each equipped 21′ boom, 16′ dipper handle, 1¼ cubic yard dipper, 50′ crane boom with 10′ removable insert. Kohler light plant driven by 4-cylinder gasoline engine. Excellent condition. Only handled one job. Shovel equipment has seen very little service. Located Philadelphia. Box 632-SS

LIMA 101 GASOLINE 1¼ YARD SHOVEL. Located eastern Pennsylvania. Good operating condition. Price reasonable. Box 576-SS.

MARION MODEL 450—1¼ YARD SHOVEL. AC-DC power. For 60 cycle, 3 phase, 440 volt current. Located eastern Pennsylvania. Price reasonable. Box 577-SS.

GENERAL COMBINATION SHOVEL-CRANE. Shovel Boom and Handle rebuilt. A-1 shape. ⅝ yard Dipper. 35′ Crane Boom. 12 New Cat Tread Links. Cat mounting and general condition machine—good. Located Georgia. Price very reasonable. Box 578-SS.

NORTHWEST MODEL 105—1 YARD GASOLINE SHOVEL. Fair running order. Located Georgia. Bargain price. Box 579-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wisconsin

TYPE "R" INSLEY SHOVEL ½ yard capacity—full revolving. Cat mounted—4-cylinder Buda gasoline engine, 45 HP. First class mechanical condition. Ready to go to work. Very favorable price. Located Milwaukee. Box 629-SS

COMBINATION SHOVEL-DRAGLINE-CLAMSHELL
Northwest Model 3 Combination Shovel—Dragline and Clamshell, without buckets. Shovel equipment 22′6″ boom, 15′4″ dipper handle, ¾ cubic yard dipper. Equipped with Wisconsin B-2 4-cylinder 5¼″x6½″ gasoline engine. Completely overhauled July, 1934. Excellent condition. Box 635-SS

E-2 DIESEL SHOVEL—26′ boom, 15′ dipper handles, 1½-yard dipper. Atlas Diesel Engine. Located Massachusetts. Box 615-SS

P&H MODEL 700—1½ cubic yard shovel. Powered with Waukesha 150 h.p. Ricardo head 7½″x8″ gasoline engine. Good operating condition. Located New Mexico. Box 652-SS.

43-B GAS SHOVEL—22′ boom, 16′ dipper handle, 1¾ yard inserted-tooth dipper. Electric starter. Wisconsin 6 cylinder 6x7″ engine. Reconditioned—first class condition. Located, New York. Box 617-SS

Small Draglines
Under 2 Yards

P&H MODEL 775—70′ BOOM DRAGLINE including 1½ and 2 yard Omaha Buckets. Extra long Crawler. Excellent mechanical condition. No repairs needed. Located near Memphis. Box No. 489-SD.

THEW-LORAIN 75-A combination 1¼ yard Shovel and 50′ Boom Dragline including one yard Drag Bucket. Good condition. Located eastern Pennsylvania. Box 610-SD.

TWO P&H 700 DRAGLINES. 1½ cu. yd. buckets on 50′ booms. Gas and Diesel. Located Lower Rio Grande Valley, Texas. Box 618-SD

P&H MODEL 206 GASOLINE DRAGLINE—¾-yd. capacity—40′ boom—good operating and mechanical condition—overhauled during past winter. Located near Chicago. Box 668-SD.

BUCYRUS-ERIE—32-B—45′ Boom Dragline—Single shaft cat. Wisconsin 6-cylinder 5″x6″ gasoline engine. Machine reported practically as good as new. Bargain price. Located eastern Nebraska. Box 673-SD.

INDUSTRIAL—BROWNHOIST—35′ Box Boom—½ cubic yard Dragline. Including Page M bucket. Self starter. Excellent operating condition. Rebuilt and thoroughly overhauled. Located New Orleans. Box 675-SD.

LINK-BELT COMBINATION DRAGLINE — SHOVEL — CLAMSHELL — 1½ cubic yard capacity. 22′ shovel boom, 16′6″ dipper handle, 1½ cubic yard Esco dipper. 45′ clamshell-dragline boom and 1 cubic yard Blaw Knox No. 618 clamshell bucket and 1½ cubic yard Esco drag bucket. Powered with Atlas four cylinder 7″x10½″ 100 H.P. Diesel Engine. Very good operating condition. Recently overhauled. Working weight as shovel approximately 85000 pounds. Complete shipping weight 100,000 pounds. Priced right. Box 650-SD.

Small Clamshells and Cranes
Under 2 Yards

BUCYRUS-ERIE 1030 GASOLINE 40′ BOOM CLAMSHELL MACHINE. Cat mounted. No Bucket. Recently overhauled. Guaranteed. Located Kansas City. Box 543-SCC.

KOEHRING NO. 2 GASOLINE CRANE. 45′ boom, 15 tons at 12′ radius. Wisconsin engine. Recently overhauled. First class working condition. Located Milwaukee. Box 630-SCC.

BYERS—BEARCAT—Half swing Clamshell Machine including bucket. Located vicinity Chicago. Bargain price. Box 674-SCC.

BAY CITY "PUP" CLAMSHELL MACHINE. Good operating condition. Box 514-SCC.

BYERS BEARCAT CLAMSHELL—Crane—30′ boom. Will handle ½ cubic yard bucket. Located near Grand Rapids, Mich. Box 648-SCC.

O & S MODEL "T" ¾ yard clamshell machine. 40′ boom. Good working condition. Powered with Climax 5½″x7″ gasoline engine. Located near St. Louis. Good working condition. Box 651-SCC.

BYERS BEARCAT 25′ BOOM CLAMSHELL (¾ swing) and ½ cu. yd. Clamshell Bucket, including Trench digging attachment carrying ½ cu. yd. dipper. 24″ wide over cutters—will dig maximum 15′. Good operating condition. Very attractively priced. Located vicinity of Wilkes Barre, Pennsylvania. Box 494-SCC.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

NORTHWEST MODEL 105 Gasoline—40′ boom clamshell. Good operating condition. Located Iowa. Box 516-SCC.

LINK-BELT COMBINATION CLAMSHELL — DRAGLINE — SHOVEL — 1½ cubic yard capacity. 22′ shovel boom, 16′6″ dipper handle, 1½ cubic yard Esco dipper. 45′ clamshell-dragline boom and 1 cubic yard Blaw Knox No. 618 clamshell bucket and 1½ cubic yard Esco drag bucket. Powered with Atlas four cylinder 7″x10½″ 100 H.P. Diesel Engine. Very good operating condition. Recently overhauled. Working weight as shovel approximately 85000 pounds. Complete shipping weight 100,000 pounds. Priced right. Box 650-SCC.

Large Shovels and Draglines
2 Yards and Over

MARION MODEL 350 WARD-LEONARD ELECTRIC SHOVEL; 90′ boom 55′ dipper handle, 8 yd. dipper; truck mounted; for 3 phase, 60 cycle, 2300 volts; series motors; excellent condition; priced reasonably; location Northern Minnesota. Box 657-LSD.

SACRIFICE PRICES
2—50-B Bucyrus-Erie Diesel Draglines with 50′ Booms, Light Plants, Buckets, Used Approximately Eight Mos. on Light Work, Shop Nos. 10218 and 10219.
1—Back Hoe Attachment for 50-B.
Located in this district.
R. C. STANHOPE, INC.
101 W. 31 St. New York, N. Y.

50-B STEAM SHOVEL, Number 3946; equipped with 1½-cubic-yard dipper, 26-foot boom, also 1½-cubic-yard dragline bucket with 50-foot boom caterpillar mounted, equipped for burning oil, located at Texarkana, Ark. Price $3,000. Box 112-LSD.

68-C BUCYRUS ELECTRICALLY OPERATED SHOVEL, equipped with 2½-yard manganese front dipper, 3 phase, 60-cycle, 440-volt motors, transformers, cable, reel and approximately 1400 feet of cable all in excellent condition. Reasonable price.
Address Box 268-LSD.

225-B SHOVEL, 6 and 7-yard dipper with caterpillars and track type equipment—in first-class condition. Located in northern Missouri. Box 452-LSD.

FOR SALE
CLASS 14 STEAM DRAGLINE with 2-yard Page bucket. Location Iowa. Very good condition. Surprisingly low price f.o.b. cars
ALSO
2-YARD MONIGHAN STEAM DRAGLINE in fair condition—cheap.
Box 419-LSD.

MARION MODEL 350 W. L. SHOVEL. New 1923, 90′ boom, 56′ handle, 6 yd. dipper, 3 phase, 60 cycle, 2300 volts, series motors. Has handled about 1,000,000 yds. stripping. Good condition. Price approximately $50,000.00 f.o.b. cars, Iron Range. Box 656-LSD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

TYPE 175-B ELECTRIC, No. 794 equipped with 87′ shovel boom, 48′ dipper handle, 3½-yd. bucket, and dragline equipment including 125′ boom, and 3½-yd. bucket. This machine was recently reconditioned and is in good operating condition. Present location, Connecticut. Box 263-LSD.

BUCYRUS 320-B STEAM STRIPPING SHOVEL, shop number 4205, new in 1925, used less than four years. Located at Toronto, Ohio. Box 74-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 347-LSD.

FOR SALE OR RENT
TWO CLASS 14 STEAM DRAGLINES, caterpillar mounted, equipped for burning gas or oil. Located, Southwest. Price approximately $4,000 each. Box 619-LSD.

100-B STEAM SHOVEL, 3 yd. dipper, location Eastern Canada. Immediately available. Used—good condition. Box 669-LSD.

CLASS-24 BUCYRUS-ERIE STEAM DRAGLINE, shop number 912; 115-foot boom, 3½-cubic-yard Page bucket. Florida location. Box 73-LSD.

50-B STEAM BUCYRUS-ERIE
COMBINATION SHOVEL AND DRAGLINE

26′ Boom
17′ Dipper Handle
2 yard Dipper
50′ Boom Dragline Equipment
1 KW 32 Volt Moon Electric Light Plant
Boiler—Standard coal burning locomotive type 54″x9′7″
1¼ cubic yard Page Bucket

INCLUDING

2 steel under-frame flat cars on which machine now loaded. New 1929. Shop No. 10557. Moved only 200,000 yards material. Excellent condition. Deal direct with owner.

PRICE VERY ATTRACTIVE

Box No. 465 LSD.

MONIGHAN DRAGLINE MODEL T, 2-cubic-yard 60-foot boom located near Wichita, Kansas. About seven years old. Has recently been thoroughly overhauled. Box 180-LSD.

FOR SALE OR RENT
2-W Monighan Walking Dragline 65 foot boom, 2 yard bucket, 80 H.P. Fairbanks Morse Diesel engine. Used on three jobs. Excavated less than 200,000 yards. Present location on Mississippi River near Cairo. Accessible to barge. Can be demonstrated. Box 606-LSD.

Locomotives

LOCOMOTIVES

6 BALDWIN, 17x24, straight drive standard gauge 45 ton locomotives. 54 inch boilers. Shop numbers from 32,750 to 34,611. Each one has passed State Boiler Inspection yearly. Boilers will stand cold water test of 240 lbs. At present in actual service in Minnesota mine. Box 152-ME.

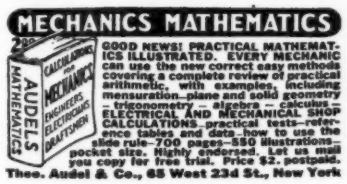
For Sale or Rent

Two 40-ton, 6-wheel switchers. Recently overhauled and rebuilt. Two 50-ton 6-wheel switchers. In excellent condition. Location Chicago. Box 306-ME.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

Miscellaneous Equipment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50 Shovels and picks, approximate.
1 Fairbanks Morse gasoline engine and 5x5 bulldozer pump 3 HP.
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4 Track jacks, 15 ton.
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10 Slips.
1 Anvil.
1 Forge.
6 Switches.
4 Frogs.
10 Switch points.
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3—Full Revolving Shovels, ¾ yd.
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32—12-yd. Western Heavy Duty Dump Cars.
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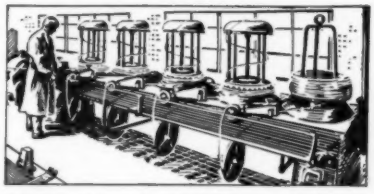

An experimental wire mill... right in the Roebling Laboratory. A duplicate, on a small scale, of Roebling's main wire drawing plant. The continuous 5-head wire drawing machine shown is part of the equipment in this experimental wire mill.

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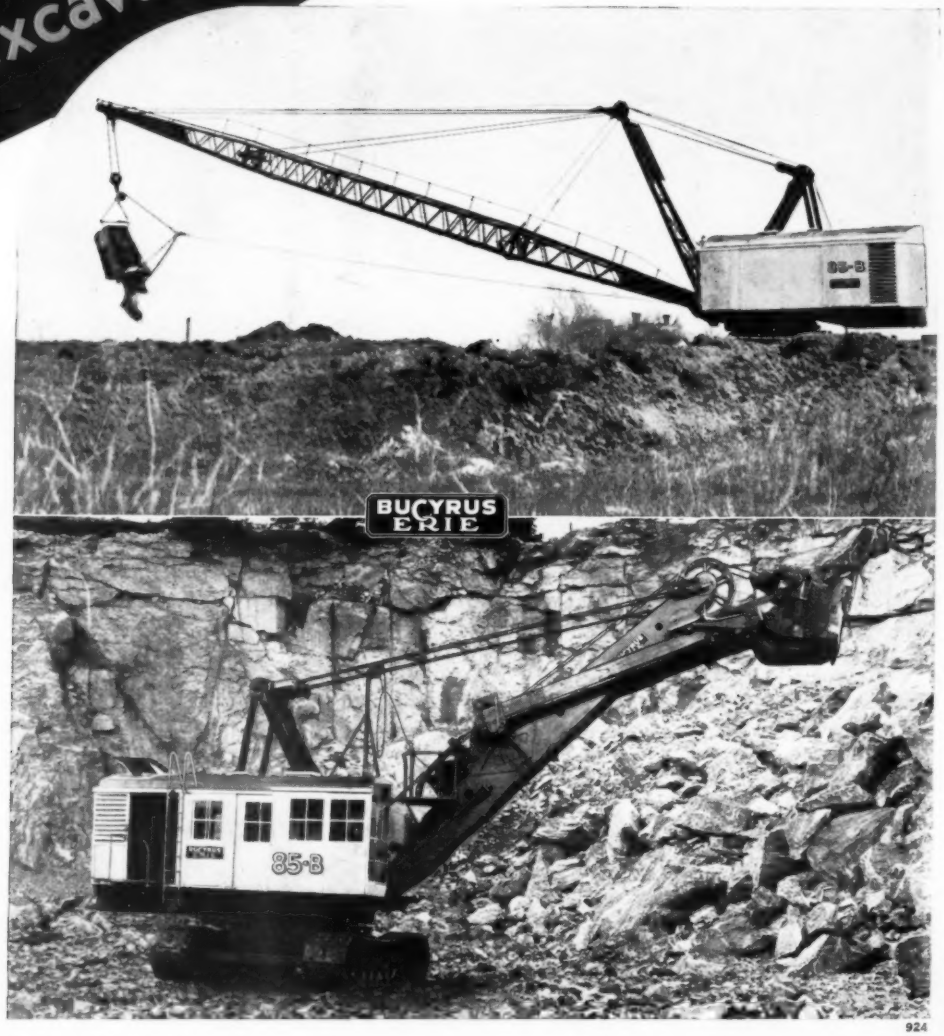

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